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Cook Electrically

DURING the next two or three months the "lower middle classes" of this country in particular, and householders of all other classes as well in a less degree, will have the merits of electric cooking brought systematically and persistently to their attention.

The full particulars of the campaign which, under the guidance and leadership of the Electrical Development Association, is to last from now until July have been placed in the hands of the electricity supply authorities. It is the most comprehensive and carefully planned effort that the Association has yet made to promote the development of the cooking load, and those who are responsible for it are convinced that the present time is particularly opportune for the movement.

It is the duty of every electricity supply engineer and manager, and every committee-man and director, to work his undertaking progressively and to help forward the sale of electricity, especially for so valuable a class of load. We, therefore, strongly appeal to him to give this campaign the benefit of his hearty co-operation. Widespread success can only be achieved if everybody "does his bit."

This effort is mainly directed to the building up of a steady and profitable cooking load among the particular class of the population already mentioned, because it is believed that that section presents the greatest opportunities. The majority of lower middle-class housewives and their domestics are already users of electric light, and are familiar with such articles as electric irons, and a large number of them with vacuum cleaners as well; it is reasonable, therefore, to regard them as having minds already prepared to be convinced by a forward movement in pursuit of greater cleanliness, labour-saving, and so forth, if they are told plainly that they can have a cooker on attractive hire or hire-purchase terms, and energy on a tariff that will not result in mental confusion and a big quarterly bill.

The electric cooker is in greater favour than ever today. It has had its ups and downs, but sales are rapidly increasing, and the present effort should accelerate the rate of advance; but the electrical supply industry cannot afford to shut its eyes to the fact that the gas interests are very active in their competitive efforts, both for better design of cooking apparatus and for charging convenient hire and hire-purchase terms. The fact that a national gas cooker campaign is in progress adds urgency to the appeal for energetic electrical action.

We hope that enthusiasm will mark the electrical campaign from start to finish. There is need for a great deal of local educative work to be done; conservatism has to be overcome; gas propaganda must be counteracted; and the people must be made familiar with the ease, safety and reliability with which cooking apparatus can be handled. This educational work must necessarily fall chiefly to those who are in charge of the development of individual undertakings.

E.D.A. has prepared pamphlets, powder and shot, an attractive poster, and a good shop window display. It will also do a good deal of newspaper advertising. But we appeal to local supply undertakings and contractors to act zealously in making a quick, systematic local survey, and organising suitable demonstrations, exhibitions and such other efforts as are possible and suited to their particular areas.

The B.A. at York

THE British Association for the Advancement of Science commenced its career at York in 1831; it celebrated its jubilee there in 1881; and so it is appropriate that the Association should begin its second century in the ancient city. The meeting is to be held from August 31st to September 7th, and this year's president is an engineer—Sir J. Alfred Ewing, K.C.B., whose connection with the Association is a long-standing one; he was president of the Engineering Section last year. The subject of his address is to be "An Engineer's Outlook," and is certain to be a thought-provoking discourse. There are many who think that if engineers had more say in world affairs there would be saner governance and less economic disorder. This view will be expressed by Professor Miles Walker, whose address as president of the Engineering Section is entitled "The Call to the Engineer to Manage the World." The subjects with which this section will deal

include the electric propulsion of ships, lighting in coal mines, railway traction by steam, oil engines, and electric power, and the pulling into step of a synchronous induction motor. One of the public evening discourses will be delivered by Mr. C. C. Paterson on "Uses of the Photo-electric Cell," a subject on which Mr. Paterson is well qualified to speak. Thus the indications are that current electrical matters will receive due attention this year.

A Lapse

About two months ago we expressed our satisfaction at Dundee Corporation's decision to buy some British cables after the acceptance of many foreign tenders. Now we learn that once again Dundee has fallen from grace by deciding to purchase cables from abroad. True, the difference between the British and foreign offers was 18 per cent., but is price the only consideration nowadays?

The New Tariff

The first report of the Import Duties Advisory Committee was published last week; concurrently (in the same White Paper) an Order giving effect to the Committee's recommendations was promulgated. The duties imposed by this Order are dealt with, in so far as they affect the electrical industry, in this issue. The new duties came into operation on Tuesday last, and at the same time the three Abnormal Importations (Customs Duties) Orders made last year were revoked. The additional dues imposed upon electrical goods and machinery amount to 10 per cent., and thus, with the general *ad valorem* duty, a total of 20 per cent. has to be paid upon them. In the case of the articles which were covered by the Abnormal Importation Orders—vacuum cleaners, radio apparatus, battery carbons, illuminating glassware, and a large number of installation accessories—there is actually a reduction of duty (from 50 to 20 per cent.), but, in spite of this, the industry is given a measure of protection which, combined with the lower value of sterling, should have a very stimulating effect.

Co-operation With the Architect

For a long time past it has been apparent that electricity and architecture are closely allied. Electricity has an adaptability that can only be fully realised by the architectural mind, but that mind must first be infused with the electrical idea. Already the proper use of electric light has been discovered by architects and employed in a marvellous manner; the all-electric house has called for special designs; and now the electric clock gives a further opportunity to architects to enhance the values of their interior decoration. An illustrated article in this issue shows how timekeeping can be raised from the prosaic to the ornamental by the co-operation of the architectural and electrical professions.

An Odious Comparison

The Steyning Gas Co. has circularised its consumers to the effect that gas at 7s. 3d. per 1,000 cu. ft. is cheaper than electricity at 4d. per kWh for lighting and 0.625d. for heating. As regards lighting, this kind of argument dates back to the Victorian era, and has long since been abandoned by the more serious gas propagandists. It is difficult to base a comparison on effective heat units consumed, but experience shows that, ignoring all the incidental economies due to electric lighting, but assuming a well-designed installation, electricity at 1s. per kWh could compete on the basis of 3,412 B.th.u. usefully applied with gas at 7s. 3d. per 1,000 cu. ft. The heating comparison (if there are as many as 500 B.th.u. in a cubic foot of the local gas) is based upon a utilisation efficiency practically the same in either case, which is absurd. But relative costs on the theoretical basis of heat units supplied at the consumer's terminals are only calculated to mislead him. The real criterion is that in a period of economic depression the amount of electricity used for domestic purposes is making rapid progress in districts where the price of gas is only about half of that mentioned above.

The G.I.P. Railway

We have from time to time referred to the electrification of the Great Indian Peninsula Railway (notably in our issues of November 22nd and December 6th, 1929, and June 5th, 1931). Last June we commented on the satisfactory operating results obtained up to that time under very onerous conditions. We deduced from Mr. F. Lydall's I.E.E. paper last night that, after making due allowance for difficulties naturally to be expected in the initial stages of a large scheme, these results have been well maintained. The most valuable part of the paper for most engineers will probably be the frank discussion of the reasons for such failures of apparatus as have occurred and the methods adopted for rectifying them. It shows incidentally how little we shall have to fear on the score of reliability from main-line electrification in the far easier conditions obtaining in Great Britain, especially if we made a preliminary trial on a 200-mile section that included a large proportion of freight traffic.

Oliver Heaviside

It is surely one of the most curious examples of the irony of fate that Oliver Heaviside should have been regarded in his time as primarily a mathematician. A brilliant mathematician he certainly was, but he used his ability in that direction for practical ends. A closer study of his work reveals, as Dr. Sumpner pointed out in his fascinating Kelvin Lecture, that Heaviside "was, first and last and all the time, a telegraphist." He used mathematics as engineers should use it, as a tool, but as he had little opportunity for translating his theories into practice, attention was concentrated on his unconventional methods of working out his ideas which, coupled with his aloofness from his fellows, resulted in a reputation for obscurity. The many examples of electrical nomenclature in use to-day that owe their origin to Heaviside provide one indication of a mind that was unusually sure of itself. His use of English was never obscure. His chief defect lay in failing to realise that what was clear to him was not necessarily so to less gifted people.

Transformers and Landladies

This title suggests an attempt to relate two very different things, as Charles Darwin once connected old maids and clover crops. It refers, however, to a tale of woe from Blackpool, where the electrical engineer (Mr. C. Furness) is at loggerheads with the ladies who take in boarders in that salubrious resort. These ladies aver that the humming of Mr. Furness's transformers in the centre of the town disturbs their peace and that of their guests. An ultimatum has consequently been issued announcing that unless the transformers are removed the rates will not be paid. Mr. Furness maintains that the humming has been greatly exaggerated, and that asbestos screens which he has had installed absorb most of it. He suggests that the noise of the protesters is greater than that from the transformers. Given the choice of these two evils we think we know which we would prefer.

The Electric Bicycle

One great defect of electrically propelled vehicles has been the necessity for recharging the battery at relatively short intervals, which has restricted the useful range of its operation to small areas. Reports from Holland of satisfactory trials of an electrically propelled bicycle point the way to new possibilities both for touring and the delivery of messages and light parcels. The distance that can be covered by the bicycle between charges is said to be fifty miles; but, judging by the performances of some of the light petrol-driven machines, we should expect an improvement on this limit to be possible.

The Shakespeare Memorial Theatre at Stratford-on-Avon

"Bright radiance and collateral light"—*All's Well That Ends Well.*

D

The Shakespeare Memorial Theatre

Electricity plays its part

LAST Saturday, the anniversary of Shakespeare's birth, was the date chosen for the opening by H.R.H. the Prince of Wales of the new Memorial Theatre at Stratford-on-Avon. Built at a cost of about £185,000, to the designs of Miss Elizabeth Scott, it replaces the earlier theatre which was destroyed by fire more than six years ago, some of the remains of which it incorporates in the street frontage.

The building is constructed on modernistic lines, and is 185 ft. high to the grid, and 121 ft. wide at the front of the stage; the proscenium is 21 ft. high by 30 ft. wide. It is the first theatre in this country to be equipped with a rolling stage, by means of which whole sets can be made up in the wings and brought into immediate use as required; when finished with the sets can be lowered complete into a well.

Lighting the Auditorium

The lighting installation has been designed throughout to be in harmony with the architectural features of the building. Over 2,000 lamps are used. About 1,000 of these illuminate the auditorium, of which 600 (pearl and daylight blue) are in ceiling fittings or in strip and cornice fittings, giving an appearance of natural daylight.

In the gallery, 120 lamps in a trough illuminate the back auditorium wall, and a further 120 lamps concealed round the tops of the pillars supporting the balcony throw a bright light over the back of the stalls. Other fittings at the back of the balcony give the necessary local illumination there. The lighting of the auditorium can be controlled either from the main switchboard on the stage, or, in emergency, from the front of the building.

The foyer, with its original note in design and decoration, is illuminated by seventy 100-W lamps. The circular grand staircase receives its light from a tower at its head, and in this are concealed 120 daylight blue lamps, which shine on to the ceiling, whence the light is reflected downwards. Beneath the tower is a fountain illuminated by a 1,000-W lamp in the ceiling.

Stage Lighting

The main switchboard, which is built at the side of the proscenium so as not to be in the way of the rolling stage, was illustrated in our issue of March 4th. One operator will be able to control the lights in the auditorium, as well as the number, colour, and candlepower of those on the stage. It is claimed that this equipment (which is British throughout), enables any electrical effects to be produced with a minimum of effort by means of interconnections and cross controls, and that it places the theatre on a footing with any other in the world.

There are 120 switches. All circuits have been individually brought back to the main control board; the protective "Desco" fuses are carried on the board, there being no fuses on any other part of the stage. Dimmers arranged below the switch panels control white, red, blue, green and amber banks, and two spot lanterns. The circuits are balanced across the 460/230-V d.c. three-wire supply.

The portable footlights have "Sunray" reflectors, and may be placed in any position on the stage or fore-stage. One batten, consisting of twelve 500-W "Sunray" floods and five 1,000-W "Seecol" spot lanterns, is placed directly behind the proscenium arch; the two others are "Sunray" magazine battens, divided into four-colour circuits, and each, together with the footlights, is subdivided on the stage board, so that either the centre or the ends on each colour may be used. On each side of the proscenium wall, at "perch" level, there are three 1,000-W "Seecol" spots and one 20-A "shutter"-arc spot.

For illuminating the forestage four-colour lighting is projected through twelve apertures in a chamber over the proscenium arch; there are also eight "Seecol" 1,000-W spots concealed in the structure of the dress-circle front, and four "Stelmar" spots in the main ceiling. Arc circuits for optical effects are installed at the stage level and in each of the fly galleries.

The Cyclorama

The lighting devices for the cyclorama are installed at the top edges and give a maximum intensity at the base, thus providing a horizon effect. The switchboard operator, by varying the intensity of the three primary colours, red, blue, and green, is able to obtain any shade of colour desired. A constellation of thirty stars may be obtained on this cyclorama by means of thirty 10-W lamps fixed behind small holes in the plaster fabric. Two cloud lanterns are also provided. This is the second cyclorama to be installed in this country, the first being that at the London Coliseum (ELECTRICAL REVIEW, October 2nd, 1931).

Other items of electrical interest include: twenty-one motors (varying from ¼ to 10 h.p.), used in connection with ventilation, operating the stage rollers and bridges, raising the fire-proof curtain, and refrigeration; twenty-six inter-communication telephones; six heating points; two cookers; and twelve clocks (controlled by a master clock). The whole of the wiring has been carried out in 30,000 ft. of "super-weld" heavy gauge screwed conduit, which was installed before the cable was drawn in. Some forty miles of C.M.A. cable has been used.

The front of the theatre is floodlighted, and the approaches on the banks of the Avon are illuminated by 2,000 lamps, all of which the Shropshire, Worcestershire and Staffordshire Power Co. provided as part of its contribution, in pursuance of its policy of entering into the life of the different towns to which it gives a supply. As a further contribution, Mr. W. Rendell Baker, the company's representative in Stratford-on-Avon, prepared the scheme for the complete electrical equipment of the theatre to the approval of Mr. J. T. H. Legge, the company's managing director. The work was carried out under the supervision of Messrs. Ridge and Aldred, who were retained by the Governors as inspecting engineers.

Conformity with L.C.C. Regulations

The supply conditions conform with the L.C.C. Regulations for public buildings. A special cable from the Arden Street works of the Shropshire Power Co. has been laid to the side of the stage; a second service deals with the front of the house and emergency lighting; and another special cable is connected to the battery at Arden Street to take over the emergency lighting. The town normally receives its supply by means of two independent high-voltage lines, one from Bidford and one from Shipston.

The principal contractors for the electrical equipment were: Knight and Co. (Engineers), Ltd., stage lights and rolling stages; the Strand Electric and Engineering Co., stage lighting and switchboard; Mather & Platt, fire appliances; the Edison Swan Electric Co., Ltd., cornice strip lighting; British Insulated Cables, Ltd., interior and exterior wires and cables and service cables; Credenda Conduits Co., Ltd., steel tubing; Ingram & Kemp, special electric lighting fittings; Geo. Ellison, Ltd., stage intake service board; F. A. Greene & Co., Ltd., standard lamps in car park; the Midland Electrical Manufacturing Co., distribution boards and front of house intake switchboard; J. H. Tucker & Co., Ltd., switches and plugs; Gent & Co., telephones; the British Thomson-Houston Co., Ltd.; lamps; Matthews & Yates, ventilating plant; Birch and Gaydon, electric clocks; and Philips Lamps, Ltd., floodlight projectors.

Stratford-on-Avon has definite advantages as a site for a national memorial theatre, quite apart from its association with Shakespeare. It is less than 100 miles from London and is only a fifty-minute train journey from Birmingham. It also forms a good centre for touring the magnificent Cotswold country.

Our thanks are due to Mr. W. Rendell Baker for information supplied, and for assistance rendered us locally in the preparation of this article.

Two-part Costs. By D. J. Bolton

The diversity factor affects the ratio of running to fixed charges

A GENERAL survey of the two-part tariffs existing in this country in the period 1929-30 was made in the ELECTRICAL REVIEW of April 15th ("Fixed and Running Charges"). It is now proposed to examine the costs and then to classify them on a two-part basis so that they may be compared with the tariffs of similar character. The method followed is to treat the whole country as though it were one station and system, working on one (average) load factor. Although not ideal, the averages thus obtained are believed to be substantially representative. There will be four groups of costs to consider, namely, fixed and running costs of generation and fixed and running costs of distribution. The figures are obtained from the Electricity Commissioners' latest return.

The working expenses of generation (fuel, wages, &c.), are first allocated to the fixed and running groups in accordance with the Commissioners' scheme for selected stations. The management expenses, and rents, rates and taxes are taken as entirely fixed costs and are divided between generation and distribution in the same ratio as the amounts of capital investment under these two heads. The working expenses of distribution are taken as being 83 per cent. fixed and the remainder running expenses. (This ratio is similar to the figure laid down for wages, &c., in the generation costs.)

These working expenses added to the (fixed) capital charges sum up the total outgoings (which must, of course, check up with the total receipts). If the surplus of receipts over working expenses is divided by the total capital investment the figure of 7.68 per cent. is obtained. This percentage can therefore be used as an annual multiplying factor for the capital investment in generation and in distribution respectively, so as to apportion the surplus between the two groups. (For the purpose of this analysis the receipts from and expenses of bulk supplies are omitted from the two sides of the balance sheet.)

In order to obtain the required prices it is now necessary to divide these expenditures by the corresponding outputs. Dividing the running expenses of generation by the number of kWh generated minus those used on works, the quotient will give the price per kWh at the station. The same expenses, plus the small allowance (17 per cent.) for the running expenses of distribution, can then be divided by the number of kWh sold so as to give the running costs to the final consumer; the number sold is 12.3 per cent. less than the number leaving the station, and the final price is therefore correspondingly increased.

Diversity of Demand

The method followed in obtaining the fixed price is similar, the numerator being the fixed costs and the denominator the kW demanded by the consumer. Unfortunately the only data available for the latter figure is the aggregate kW demand on the stations, which will be less than the sum of the consumers' demands owing to their diversity. As regards bulk purchases at the station, the diversity factor will be comparatively small and may be taken as something between 1.1 and 1.2. (A figure of 1.15 is here assumed.)

For the final and low voltage consumer it will be much greater, since it will be the combined result of a number of successive elements—the diversity of separate consumers on a street main, of a number of mains at a sub-station, and of a number of sub-station loads meeting at the generating station. The choice of a figure must necessarily be largely guesswork, the only certain fact being that it cannot exceed 2.5, which is the figure given in the return for the ratio between the *connected* load and the aggregate maximum demand. The assumption here made is that there is a further diversity of 1.4 (subsequent to the power station feeders) giving an over-all total of 1.6.

Another factor which must be included here is the loss in kW capacity in transmission and distribution. This will be somewhat less than the corresponding loss in kWh, and the figure here taken is 10 per cent. The complete results are summarised in the following tables:—

SUMMARY OF COSTS (Millions per annum).

RUNNING COSTS—GENERATION.

	£
81 per cent. of fuel	5.67
Appropriate percentages of other working expenses	0.92
	6.59

Dividing by 10,401 (kWh generated) less 6.1 per cent. used on works gives 0.162d. per kWh.

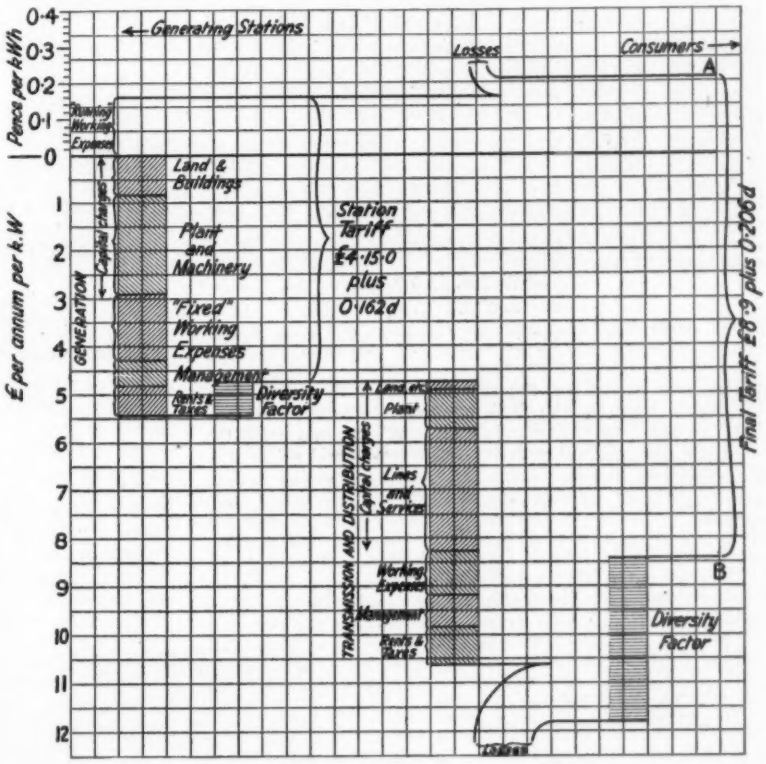
TRANSMISSION AND DISTRIBUTION.

Working expenses of distribution allocated to running costs	0.75
	7.34

Dividing by 10,401 less 6.1 per cent. less 12.3 per cent. (transmission loss) gives 0.206d. per kWh.

FIXED COSTS—GENERATION.

	£
19 per cent. of fuel	1.34
Remaining percentages of other working expenses ..	3.62
Management and taxes for generation	4.23
Capital charges for ditto	10.49
	19.68



Dividing by 3.60 (kW of total demand on station) multiplied by 1.15 (diversity factor) gives £4 15s. per annum per kW.

TRANSMISSION AND DISTRIBUTION.

	£
Working expenses of distribution allocated to fixed costs	3.80
Management and taxes for transmission and distribution	5.89
Capital charges for ditto	14.60
	43.97

Dividing by 3.60, multiplied by 1.6 (diversity factor) less 10 per cent. (kW transmission loss) gives £8 9s. per annum per kW.

As a rough check on the over-all diversity figure made use of, the purely lighting consumer will probably not use at any one time more than twice the wattage of lamps in use continuously. Assuming an average of four hours' lighting a night throughout the year, the load factor will be 8.3 per cent. Allowing for non-lighting uses the average domestic individual load factor will be in the neighbourhood of 10 to 12 per cent. The power consumer, working a 48-hour week and averaging during this time 75 per cent. of his maximum, will have a load factor of 22 per cent.

A numerical average of all the individual load factors throughout the country should therefore be about 20 per cent. Now, the mean load factor on the stations for the year was 33 per cent., and the ratio 33/20 is 1.65, thus agreeing very

closely with the over-all diversity factor already chosen.

These figures are illustrated by a two-part diagram divided into two by a horizontal zero line. Above this line are plotted running charges in pence per kWh and below fixed charges in £ per annum per kW. The left-hand side of the diagram indicates the generating stations and the right-hand side the final consumers. The fixed costs at the station are made up of the capital charges on the generating equipment, certain proportions of the fuel and other working expenses, and a portion of the management and taxes. The price is reduced owing to diversity factor at the station, and the bracket indicates the dual charge at this point. Transmission and distribution costs are then added, and the dual charge to the final consumer is shown on the extreme right.

Although the two scales are of different kinds, they can be combined at any particular load factor so as to express the over-all charge per kWh. In the present case the average individual load factor is 33 per cent. divided by 1.6 (diversity factor), *i.e.*, 20½ per cent. The two scales of this diagram have therefore been selected so that with this particular load factor they can be added numerically. The distance AB on the diagram therefore represents, in pence per kWh by the upper scale, the over-all price per kWh to consumers with this "average" load factor. A working model of this diagram will shortly be available.

Comparison of Costs Estimates

In the appended table are summarised the figures obtained above, followed by two estimates made some years ago by Mr. S. J. Watson, and followed by two estimates which have been made from time to time of the probable grid tariffs.

Origin.	Tariff.	Ratio.
As above	At station, £4 15, plus 0.162d. ..	29
	l.v. distribution, £8 9, plus 0.206d.	41
S. J. Watson ..	At station, £2 17 3, plus 0.125d...	23
	l.v. distribution, £6 9 2, plus 0.159d.	40.5
"Grid" estimates	£3 5, plus 0.2d.	16
	£3 10, plus 0.23d.	15

The ratios for the first two sets of figures are much lower at the station than for the final consumer. (The ratio for the latter is approximately forty in each case.) In comparing the country's mean figures with the estimates of grid prices it is only necessary to consider the generating costs of the former, and the diversity is comparatively small. The country's mean costs indicate a figure about 25 per cent. less in the running charge and about 40 per cent. more in the fixed charge giving nearly twice as big a ratio between the two parts.

The reasons for this are probably: (1) that the grid estimate must include some line losses as compared with the other figures, which are busbar prices at the separate stations; and (2) *the extravagance of our pre-1926 plan of individualised generation lay almost entirely in the fixed costs*, as the small stations contributed so little to the total output that their high running costs had little effect on the total fuel consumption of all British generating stations.

Costs *versus* Tariffs

The central fact in comparing the country's costs with the country's tariffs (omitting any comparison of actual magnitudes) is that the ratio between the two parts has a uniform value of about ten in the tariffs, whereas it is three or four times as great in the costs estimate.

The practical reason for not using in the tariff the proportions which appear to be dictated by cost considerations is that so high a fixed price might repel consumers even though combined with a very low running charge. But the practice has the sound theoretical basis that the diversity factor, which has so far been taken as an average for all consumers, does in fact vary from consumer to consumer.

Different *classes* of consumer will make differing contributions to the diversity factor, depending far more upon differences in the quality and "time-of-day" characteristics of the load than upon its load factor *per se*. A number of cooking loads each of ten per cent. load factor may combine to give a fifty per cent. load factor on the sub-station, whereas a number of lighting loads each of ten per cent. load factor will probably only give a combined factor of 12 to 15 per cent.

The lower the consumer's load factor, other things being equal, the greater is the likelihood of his having a good diversity with others of the same class. Thus it will be obvious that two one hundred per cent. load-factor consumers cannot have any diversity with each other, whereas two fifty per cent. load-factor consumers might have a diversity of two, giving a one hundred per cent. load factor on the station.

The maximum possible value for the diversity of any group of loads of the same load factor is the reciprocal of that load factor. This maximum value would be such a diversity as to transform the station load factor to one hundred per cent. The actual value in practice might be something like one-half of this in the case of cooking, one-third in the case of heating, one-quarter with power, and one-fifth with lighting loads.

Diversity at Varying Load Factors

Where it is not possible to differentiate between the classes, a possible figure would be to reckon the diversity factor as certainly not greater than the square root of the reciprocal of the load factor. Thus a group of 25 per cent. load-factor consumers would have a diversity factor of something under two, whilst ten per cent. load factors would have a diversity not exceeding three. These figures would still be too high when dealing with consumers all of one type, although they might be achieved where there was a good variety of types. In the absence of positive data an empirical rule may therefore be suggested that the diversity factor equals $\left(\frac{1}{\text{L}}\right)^n$ where L is the load factor, and where the index n has some value less than 0.5. Such a rule might then be applicable to a whole range of likely load factors.

If two consumers, having load factors of fifty per cent. and five per cent., respectively, consume the same amount of energy and pay the same fixed price per annum per kWh, the second will pay ten times as great a fixed charge as the first, but in the aggregate (when combined with others of his kind) he does not monopolise ten times as much generating and distributing plant.

The conclusion is that a tariff based on actual costs and the assumption of a single mean diversity factor results in an undue penalisation of the low load factor consumers. The simplest way of redressing this injustice is to alter the proportions of the two parts by reducing the fixed charge whilst increasing the running charge, so as to leave the total revenue the same as before.

Adjustment Values

In order to illustrate the actual value of the adjustment that might be made, consider the country's "average" consumer at a load factor of 20.5 per cent. Putting $\left(\frac{1}{0.205}\right)^n = 1.6$ (the assumed mean diversity factor) the value obtained for n is 0.3. Assuming that the tariff of £8 9s. plus 0.206d. gives the correct overall figure at the mean load factor, it is easy to calculate what should be the right overall figure at some other load factor L, allowing for a diversity varying according to $\left(\frac{1}{\text{L}}\right)^{0.3}$.

Let p pence per kWh be this overall price. If then we are to have a "biased" tariff consisting of £x per annum per kW plus y pence per kWh, this must be such as to bring in the correct revenue at the average load factor, and also such as to give an overall price of p at the load factor L. Equating both sets of facts gives two simultaneous equations with three unknowns, x, y and L.

By trial, approximate values of x and y can be found which satisfy fairly closely over the useful range of L, say, from 10 to 30 per cent. For example, the correct values for 10 per cent. load factor give the ratio $x/y = 8\frac{1}{4}$, at 20 per cent. load factor the ratio is 10, and at 30 per cent. it is 12. If a smaller assumption is made as to diversity, *e.g.*, an overall mean for the country of 1.5, the value of n will be 0.25. The best ratio between the two parts of the tariff is then about 12½ for the useful range of load factors.

Taking a ratio for x/y of 10, the tariff becomes £5 14s. per kW plus .57d. per kWh. This brings in the required revenue at the mean load factor, whilst the correction for diversity variation is almost exact for load factors from 15 to 25 per cent. and very close from 10 to 30 per cent.

Bulk Supplies

A similar line of reasoning can be applied to the price at the station busbars, which on a purely costs basis has a ratio of 29. For the useful range of load factors at this point, say, 15 to 40 per cent., the "biased" tariff then becomes £4 3s. per kW plus 0.22d. per kWh, the ratio between the two parts being 19. (The change from the "costs" ratio is less in this case because the distance from supply to consumer is less, *i.e.*, there is less diversity and therefore less scope for diversity variation. As a result n has a smaller value.)

The "moral" appears to be that, whilst costs considerations point to a ratio of 30 to 40 between the two parts of a tariff, the lower ratios which are commonly employed in the selling tariffs are actually quite justified on grounds of economics as well as of policy. Now that standardisation is so much to the fore, standardisation of the two-part power tariff is an obvious line of advance. A ratio between the two parts of 10 to 15 for low-voltage supplies and 15 to 20 for bulk supplies is suggested as the outcome of the present investigation.

A Desert Power Station. By C. O. Jenkyns

The Trans-Australian Railway's new plant

THE former power plant at the Port Augusta (South Australia) workshops of the Trans-Australian Railway comprised suction gas engines coupled to two 115-kW and one 20-kW sets. It became unable to carry the load, mainly due to deterioration caused by dust, which was so severe that the maximum load which the whole plant would carry was under 110 kW. As an additional load of about 300 kW was expected from the new locomotive works, it was decided to install a complete new plant.

The tender of Messrs. W. H. Allen, Sons & Co., Ltd., was accepted for one 740-b.h.p. airless injection Diesel engine with a 500-kW d.c. generator and two 308-b.h.p. engines with 200-kW generators, complete with all auxiliaries.

The distribution is on the three-wire 440-V system with grounded neutral. At the time of installation the largest set was the heaviest Diesel land engine in Australia, although larger sets are in use in ships on the coastal service.

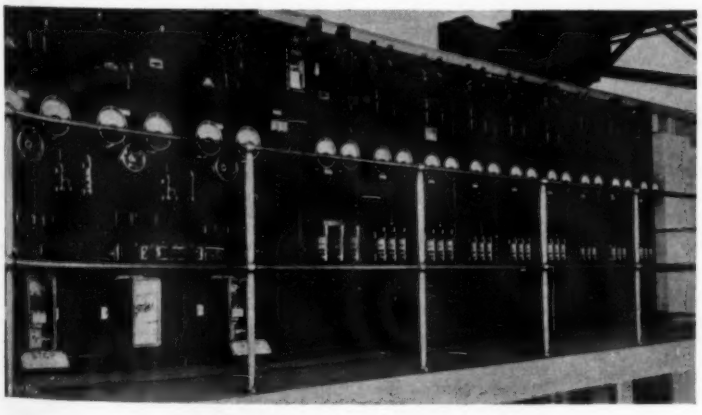
Owing to the use of a low-voltage d.c. system and the fact that the peak load of 700 kW was all due to the locomotive works a site close by was a *sine qua non*, but the ground was so bad that a loading of half a ton per sq. foot was too much for it. Piling was impracticable because no bottom to carry a live load existed for perhaps a thousand feet as numerous underground streams flowed through the sand.

The only alternative sites were one and a half miles away, and the copper and transmission cost absolutely ruled them out. At this point I endeavoured to obtain a reversal of the policy in favour of a.c. but without success, so a raft foundation was decided on to carry the whole building and engine foundations in one, but a recent letter from the site states that the foundations are likely to prove a source of great anxiety and expense.

The Water Supply

Good fresh water being scarce in the locality, it was decided to use sea water from Spencer's Gulf, at the head of which Port Augusta stands, but as this frequently has a surface temperature of 90 deg. F. in the summer water had to be drawn from a depth. Alongside the town pier the largest ocean-going ships can lie at low water. Here two submerged centrifugal pumps were installed to pump from eight fathoms below L.W.O.S.T., at which depth the water remains uniformly at about 40 deg. F. all the year round, a branch of the Antarctic current flowing straight up the Gulf.

These pumps are direct driven by vertical spindle motors housed on the pier. The motors are controlled by contactors actuated by push buttons on the power house control platform about one and a quarter miles away. The water passes by a buried pipe line to protect it from the heat of the sun to the power house. A rising main supplies a 10,000-gal. service tank for use when starting up or in emergencies.



Main switch gallery at Port Augusta

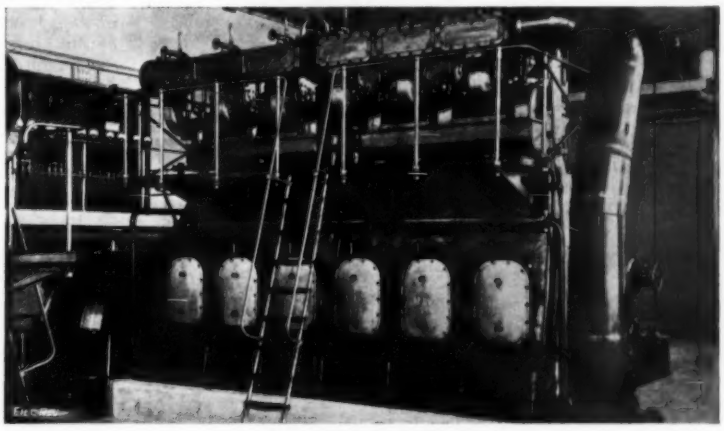
Finally the spent hot water is discharged on to the beach two miles away from the point at which it is obtained. The cost of this water service of 20,000 gal. per hour exceeded £4,000. The water is also used for air cleaning and fire purposes, a separate 10,000-gal. tank being provided with a special pump for the purpose.

Air-conditioning Plant

About three severe dust storms per week in the winter is Port Augusta's unenviable record, during which the darkness is often equal to the worst November London fogs, and dust settles as thick as in a cement mill. A compressor lost 40 per cent. compression in eighteen months solely because of erosion due to inhaled dust. This meant that the Diesel engines would have to be completely protected.

Accordingly an air-conditioning plant was installed through which passes all the air entering the power house and plant, the power house being air tight with balanced louvres in the roof which permit only the egress of used air. The air is washed by passing through several sheets of sea-water spray; it then passes over a number of wet surfaces, inclined to the direction of flow in alternate directions, and is finally driven into the building at a positive pressure of 0.5 in. of water. Each engine and the compressor receives its air through ducts direct from the washer so that no after contamination can occur.

The remainder passes up through the generators, and so cools them before entering the engine room. A further trunk discharges immediately below the platform for the benefit of the engineer-in-charge. In the old station I have seen the thermometer stand at 137 deg. F. at floor level in the coolest spot, *i.e.*, the induction of the compressor.



The 500-kW Diesel set

In winter, freezing point is often reached at night, when the air is warmed by the hot circulating water. By these means a uniform temperature is obtained all the year round at no extra cost for heating and ventilating. A steel roller shutter closes the main entrance to the power house. General ingress and egress is by a revolving door on the side opposite the switch gallery, below which are the balancing transformers. A third door of the ordinary single leaf pattern, kept locked from the inside, is solely a means of escape in an emergency.

Low Running Costs

A 10-ton overhead crane covers the whole power plant, including the switchboard, and can handle the engines and generators with the minimum amount of dismantling. The engines selected were not the lowest in price, but, on the basis of interest, guaranteed depreciation, guaranteed fuel and lubricating oil consumption, repairs and foundation and house room costs, their cost worked out at the lowest per kWh; in addition, the prospect of repairs appeared less.

In the power house is also a 1,200 cu. ft. two-cylinder air compressor working at 100 lb. per sq. in. This machine is direct coupled to a 250-h.p. d.c. motor and is controlled by a contactor operated by pneumastatic control on the machine itself and push buttons on the controller and the house control platform. The set is mounted on a bed parallel with the generator sets. It was built by Kelly and Lewis, of Melbourne, and apart from external finish appears to be a first-class job.

The main switchboard is of Australian manufacture, and consists of three generator panels, one 1,000-A, five 500-A, and three 250-A feeder panels. All 440-V circuits have the mid wire carried through ensuring that a low-voltage supply is available everywhere. A low-volt release is provided to ensure that the board shall be instantly cleared in the event of a power failure so that fullest protection is given to both station and shops.

Each circuit is run in screwed solid conduit, and every box or fitting has a cover. The conduits are laid in concrete troughs in the shop floors which are painted on sides and floor with bitumen. A layer of burnt sand is under the conduits and also covers them to a depth of not less than 2 in. A final sealing of bitumen ¼ in. thick makes the whole waterproof and ratproof. The troughs are covered with hard wood blocks about 9 in. by 9 in., and a master asphalt floor covers the lot. The position of the trough is indicated by copper studs set in the asphalt at each corner or tee.

The Permeability of Sheet Steel. By G. Waters, B.Sc. (Hons.)

IT recently fell to my lot to carry out some tests on various samples of commercial sheet-steel stampings used to form the salient poles of d.c. motors. It had been the practice to buy the cheapest sheet steel, about $\frac{1}{16}$ in. thick, for the purpose, the chief quality looked for being ease in punching. The electrical and magnetic properties were left to look after themselves, as it was thought that at the densities contemplated no trouble would be experienced; nor was it for some considerable time; but when several machines on test were unaccountably quite a long way from the expected results, and investigation of the usual kind failed to elucidate the cause, it was decided to carry out some tests on samples of the steel used for the main poles.

Mr. G. Waters, who for several years was the designer of electrical machines for Messrs. Clarke, Chapman & Co., Ltd.

No calibrated apparatus being available, it was necessary to construct our own; the results obtained provide an example of what can be done without specialised apparatus.

Four different makes of steel were selected for test and specimens prepared in the following manner. Two suitable circular punches were used to punch out annular rings from the different qualities of steel, the diameter of these rings being 9.2 cm. outside and 6.03 cm. inside; a sufficient number of each kind was taken, so that when they were taped together the area of the complete specimen was 2.73 sq. cm. An exciting winding consisting of 100 turns of 0.056 in. dia. copper wire was next wound on each ring, the turns being spread out all round the section, and at one particular place a small search coil consisting of 50 turns of 0.0084 in. dia. copper wire was also wound. This completed the preparation of the samples.

A standard solenoid was now required. This consisted of a long wooden rod 108 cm. in length and 5.08 cm. in diameter and wound with 671 turns of 0.056 in. dia. copper wire. In the centre, 1,000 turns of 0.029 in. dia. wire was wound to act as a search coil. For the galvanometer a " Cirscale " central zero ammeter was used (really a milli-voltmeter).

The readings were obtained in the following sequence. The standard solenoid was put in circuit with a suitable variable resistance and a reversing switch, which was electrically operated to ensure that its time of operation was, for all practical purposes, constant. The search coil of the standard solenoid, together with the search coil of one of the specimens to be tested, were connected in series with the galvanometer. A direct current was next caused to flow in the standard solenoid circuit, and its value was adjusted so that when the reversing switch was operated a suitable deflection was obtained on the galvanometer. A few readings were then taken of the ampères in the standard solenoid and the deflection of the galvanometer pointer when the current was reversed, these figures being plotted in fig. 1.

The exciting winding of one of the samples was then put in the circuit in place of the standard solenoid, and the respective search coil connected to the galvanometer (in series with the search coil of the standard solenoid to maintain a constant resistance). The deflections were again noted when certain currents were reversed in the main circuit. These results are also plotted in the left-hand figure. It only remained to arrive at suitable scales for B vertically and ATS/cm. horizontally.

As the whole of the samples are identical, so far as the exciting windings are concerned, the number of turns, the current in them, and the mean periphery will readily give the ATS/cm., so the horizontal scale is determined.

To determine B for any value of the ATS/cm., take, say, the deflection which equals 100, then, by calculation, for the ironless solenoid we have: $H = 1.25AT/L$.

For the standard solenoid we have: $AT/L = 671 \times 13/108$, and $H = 1.25 \times 81 = 101.2$.

The mean area of the search coil is calculated at 24 sq. cm., so that the total flux in the search coil is 24×101.2, which equals 2,430 lines.

These lines are linked with the 1,000 turns of the search coil on the solenoid, and the total number of linkages is therefore 2,430,000.

This same deflection (100) was obtained on one of the samples with a search coil of only 50 turns; the total number of lines in sample is therefore 2,430,000/50. As the area of sample is 2.73 sq. cm., B is $2,430,000/50 \times 2.73$, or 17,800 lines per sq. cm.

In this manner several points can be calculated, and the " B " scale constructed on the vertical axis. In fig. 2, curve 1 relates to Sankey's No. 1 Lohys, and the results agree very closely with the published curves. Nos. 2 and 3 are quite good enough for general use, but sample 4 is definitely bad, and it was this material which had been giving trouble in the completed machines. Since eliminating No. 4 quality sheet steel no further inaccurate results have occurred.

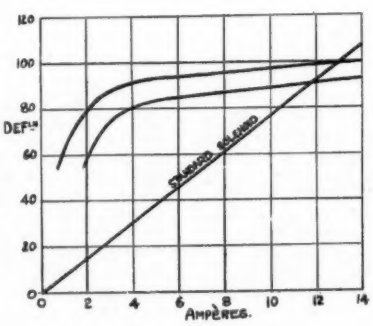


Fig. 1

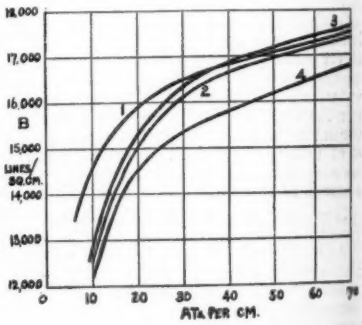


Fig. 2

The "Junior's" Dinner

THE forty-eighth annual dinner of the Junior Institution of Engineers was held on April 22nd at the Hotel Metropole, W.C. Proposing the toast of " The Institution," Sir Cyril Kirkpatrick (president, Institution C.E.), said that the membership was now 1,600, and that among the chief objects of the body were the increase of technical knowledge and the provision of employment. Mr. S. Foster Petrie (chairman of the Institution) responded.

The toast of " The Electrical Supply Industry " was proposed by Capt. J. M. Donaldson (president, I.E.E.), who implied that recent exhortations of the Minister of Transport must refer only to the few black sheep among the undertakings, as the average authority had more courage and vigour than ever before. The Gas Light & Coke Co., he said, was the biggest undertaking of its kind in the world. In 1930 it had sold 247 million therms, equivalent to 7,250 million kWh gross. Allowing 25 per cent. for more efficient utilisation in electricity reduced the latter figure to 5,430 million kWh. In 1929 the output of authorised electricity undertakings was 8,596 million kWh.

Dr. S. L. Pearce (president of the Institution), replying, referred to the classic address by Dr. John Hopkinson to the Institution in 1892, when he laid down the basic principles for the construction of tariffs. This year was the jubilee of electricity supply, as, although a public lighting supply was inaugurated in Godalming in 1881, it was not until 1882 that the general supply of electricity was undertaken. Failure of undertakings to take advantage of the opportunities of improving the supply position given by the 1919 Act had led to the formation of the Central Electricity Board under the management of Sir Archibald Page. This work was of a magnitude surpassing that carried out in any other country.

The grid must not be allowed to fall short of success through failure in distribution and selling ability. If voluntary methods could not achieve the desired end, sooner or later further legislation would be inevitable, and the work would be carried out under official administration. On the technical side great advances had been made, and the average kWh generated per ton of coal had increased by 75 per cent. in ten years. One power station in the U.S.A. had a thermal efficiency of 29.4 per cent. and there was no reason why we could not equal that in Great Britain.

The health of the guests was proposed by Mr. H. F. Wright (vice-chairman of the Institution). Sir Alexander Gibb and Sir Felix Pole briefly replied. Sir Alexander said that fifteen past-presidents had been Fellows of the Royal Society. Mr. E. Ambrose (vice-chairman of the Institution) proposed the health of Dr. Pearce.

Synchronous Electric Clocks

Reasons for increasing popularity

THE rapid advance in public favour of synchronous electric clocks appears to have come to some members of the electrical industry as a surprise. Nevertheless, problems arising in connection with them have been discussed in our pages for several years past. Far-sighted and enterprising electrical contractors have not, however, waited for academic discussion to settle the pros and cons, but with true pioneer instinct for "blazing their own trail" have boldly tackled this new outlet.

In the course of the past three years valuable experience has accumulated and definite lines of progress are indicated in the number of installations carried out in important buildings.

At the Dorchester Hotel, London, the installation of "Synclocks" presented many problems to both the clock-makers and the wiring contractors. In the first place the construction of the fabric made it necessary that fittings, which in the finished building had to be concealed in the walls, should be put in as the building went up. Arrangements for wiring and fixing the clocks therefore had to be made in advance, and since all the clock movements were of standard size, it was decided to insert cast iron boxes at the positions where the clocks would ultimately be fixed, conduit being carried to them from the nearest distribution centres.

These boxes were wired up in due course, and when the time came to fix the dials it was only necessary to screw the fitting to the cast iron box, suitable screw holes having been provided for the purpose. No arrangements other than wiring back to the nearest distribution board were attempted. Special clock circuits were deemed unnecessary, and this bold course was justified by experience. A letter appearing in our correspondence columns (Dec. 18th, 1931, p. 922), stated that from the day the installation was completed the clocks had required no attention whatever.

The ornamental dials, some of which are to be seen in our illustrations, were specially designed by the makers of "Synclocks," Messrs. Everett, Edgcumbe & Co., Ltd., who carried out the installation.

Decorative Value

The success of this installation has attracted widespread attention to the decorative value of these new clocks, and in the planning of almost every new building their ornamental possibilities are being exploited. Among notable installations carried out recently may be mentioned those at Claridge's Hotel, London; the Paramount Cinema, Leeds; and the South London Technical School.

The experience thus gained at an early stage in the development of synchronous clocks has established precedents which will undoubtedly influence future developments. Even in the domestic sphere there is a reaction from the conventional mantelshelf clock, due in part to the absence of the mantelshelf itself in modern electrically equipped houses, but perhaps mainly to the restless spirit of the age, when every fashionable hostess is looking for something more modern and distinctive.

One modern tendency appears to be to sink the movement into the wall, leaving the dial flush with the surface, the concealed wiring being carried direct to the movement. The synchronous clock with its compact movement, needing no winding and no regulating—in fact, no attention of any kind—lends itself admirably to this new development. Transparent dials illuminated from the back, or opaque dials lighted by tubular lamps concealed in the moulding round the dial, are favoured by the ultra-modern.

Synchronous clocks are, of course, permanently wired and, except for bracket clocks, the earlier slogan of "plug in" has largely gone by the board. The work is thus definitely within the province of the electrical contractor, and, accustomed as he is to making the most of the decorative value of electrical fittings, this new development need cause him no apprehension.

Self-starting Motor Indispensable

A point which emerges from this new fashion in timepieces is that a self-starting motor is absolutely necessary. One which has to be started by hand leads to complications in construction and hopelessly cramps the style of the artist and the designer. It would seem, therefore, that the type of motor which does not start itself must be ruled out altogether except perhaps for the mantelshelf or bracket type of clock and even for that purpose its disadvantages are many.

To sum up, it would appear that modern development in synchronous clocks and modern tendencies in decorative art are playing direct into the hands of the electrical contractor if only he will rise to the occasion. It is not the sale of a few cheap mantelshelf clocks over the counter at which he should aim, but the supply, fixing and connecting up of artistic timepieces harmonising with their surroundings. They will attract attention and so act as an incentive to further business. Moreover, with an eye to the future, wherever he puts in a new installation or extends an old one, let him always advise the provision of "clock points" in convenient positions. The synchronous clock has come to stay and is an *electrical* device.

"Synclocks" in various ornamental settings:—1. A tinted mirror dial. 2. Dial engraved on wood panelling. 3. Dial formed by glass panel. 4. A metal skeleton dial in the wall. 5. Clock inserted in mirror on the glass. All these clocks are at the Dorchester Hotel except No. 3, which is at Claridge's Hotel.

An Improved Hacksaw Frame

Messrs. James Neill & Co. (Sheffield), Ltd., Napier Street, Sheffield, are marketing a new hacksaw frame embodying many outstanding improvements. This new saw, called the "Eclipse" No. 50.R.S., has an adjustable but rigid frame.

The arrangement for adjusting the saw is housed inside a handle designed to give a firm grip so as not to fatigue the hand. The bow is made of dumb-bell section silicon-manganese spring steel, and the tension screw sockets are part of the bow itself, being formed by slitting and bending the end. The tension pegs are made of .45 per cent. unbendable carbon steel, while the tension screw is case hardened and of the two-lead type. The saw is adjustable between 9 and 12 in., and weighs 16 oz. with a 12-in. blade.

Switchgear Production

Developments at Crompton Parkinson's Chelmsford works

ONE of the most striking examples of a modern d.c. switchboard that we have seen is that under construction by Messrs. Crompton Parkinson, Ltd., for the Ford works at Dagenham. Its duty will be to control three 8,000-A 220-V generators and sixteen 3,000-A feeder panels. The bus-bar supports are of the locked-vice type and are insulated with "Bakelite." At the back of the board isolating links are provided for the three or four 0.1 sq. in. cables taken from each panel.

Each blade of the knife switches is built up in two halves, separated by spiral springs which fit into recesses cut into the blades. By this means the blades are kept in contact throughout their width; little muscular energy was, we found, required to operate a switch. It is claimed that with this

New type kiosk on skids for transport.

construction the volt drop is lower than with the clamped-contact switch.

One of the a.c. flat-back boards embodied 900-A breakers with switch bushings of laminated copper strips sweated into the contact block in the oil tank and insulated by "Bakelised" paper wrappings with separators between the laminations; the complete bushing is clamped into the switch top. The method avoids the use of round studs, which are not used above 600-A duties on account of skin effect. The top of the switch is of aluminium alloy, as are also the bushing clamps. The tank-lowering device consists of a worm and wheel with wire rope, an arrangement used almost exclusively throughout the whole range of oil switches, and one which makes for easy accessibility.

Kiosk Manufacture

A number of kiosks of various sizes were seen in the large assembly shop. The rounded corners are produced by hydraulic pressing, which enables a wide lap to be given to the doors and screens. The whole of the framework is welded and provides the support for the switchgear and other apparatus before the doors or roof are fitted. The three internal hinges provided for each door are connected to the pressed corner posts by a pin supported on a welded steel stiffening piece across the corner. The roof and floor are also welded to the corner post. Exterior doors and screens are of $\frac{3}{16}$in. steel, and may be unbolted from the structure to obtain complete access to the interior. The inside of the roof is coated with cork granules to prevent condensation.

These kiosks, up to five tons in weight, can be transported in one piece, as assembled at the factory, and dropped on to their foundations, reducing erection work on site to sliding on to the base and bolting down.

Oil switches for truck-type gear, for the higher rupturing capacities, are hydraulically tested to a pressure of 150 lb. per sq. in. The isolating plugs are original in design. The insulator supporting the plug contact is rectangular and the contact, of hard drawn copper strip, is formed of the same piece as the connection through the insulator, thus avoiding a joint between the contact and the bolted joint at the other end. The complete plug contact is constructed in two halves, in the middle of which is a brass strip whose function is to retain in position the spring pressing on the inner folds of the plug contact; the contact stem is fixed into the insulator by one bolt only, which also clamps the connections to the stem. Self-alignment is obtained along the whole length of the plug; the insulator is always in compression.

In the stationary portion of the truck the contact is bolted to a large insulator (used instead of the more usual cemented fixtures), the head of the bolt being inside the porcelain and the nut outside.

Vertical Drop-down Switchgear

The recently introduced "Klad" vertical drop-down switchgear is now in full production. Perhaps its most interesting electrical feature is the variable overload release, which is carried on the insulated cross-bar. The overload plunger moves in a horizontal direction and releases the switch by operating "Bakelite" tripping rods. At the calibrated setting there is a time lag of ten seconds and an inverse characteristic of twenty seconds.

Bus-bars are enclosed in a steel cover, which makes them most accessible, but only after the complete switch has been lowered to the ground, thus eliminating risk of unauthorised interference. Ammeters are operated by simple ring-type current transformers installed in the connecting chamber at the back of each unit; the scale of these with first-grade accuracy may be as low as 0-30 A.

The "T.A.P." switch is a fuse-type oil switch which is tripped by the blowing of a fuse on any one phase. With a standard fuse 90 per cent. of the fusing current can be carried for eight hours without blowing, whereas the more usual ratio is 3 to 1. A ring-main unit has been designed to line up with the "T.A.P." switch; this consists of an oil-immersed unit, with load-operated switches on either side of the ring, and the complete unit can be bolted direct to a switch controlling the tee.

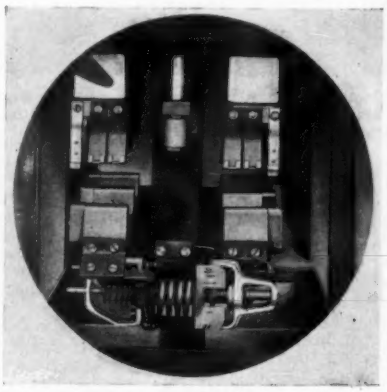
Pole-mounting Switches

Pole-mounting oil switches on view embody series trips and have their live parts immersed in oil or compound. A winch lowering gear lowers the oil tank from the switch when mounted on its wrought-iron framework.

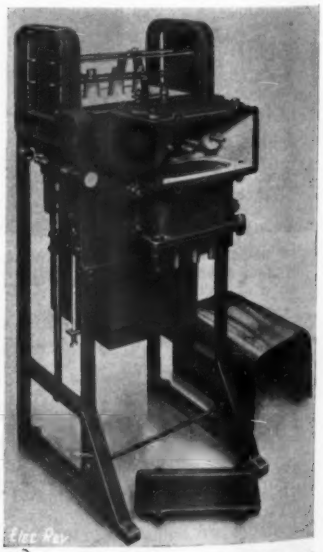
In the steelwork shop kiosks and tanks were being cut or welded by electricity or oxy-acetylene, electricity being found more suitable for thick metal. Many important developments are in hand at the present time, as regards both switchgear with a rupturing capacity up to 250,000 kVA and the smaller ironclad gear which will complete the "Klad" range.

Another interesting item that we inspected was a new potential indicator in the form of a neon lamp in a tube of insulating material, which is mounted on an insulator fixed to a spindle. One indicator per phase is generally used, the three phases being mounted on a common spindle, the arrangement being such that the spindle is held from rotation by means of a spring.

When it is desired to put the indicator into operation, a small handwheel is turned; this brings the neon tubes into close proximity with the live conductors and enables an indication to be obtained whether the conductors are alive. This indicator provides an alternative to the use of smaller testing devices mounted on the end of a rod held in the operator's hand. It has the advantages that the operator grasps only earthed metal and that the three phases are seen at the same time.



The "Klad" circuit breaker (open) showing tripping solenoid



The "Klad" breaker with bus-bar and current transformer chamber covers removed

A new bay of the switchgear department is under construction of a sufficient height to handle the largest sizes of modern switch and control gear.

Fractional Horse-power Motors

THE fractional h.p. motors made by the British Thomson-Houston Co., Ltd., are produced in sizes up to 3/4 h.p., and are designed to operate continuously at their full rated load with low temperature rise, with liberal overload capacity.

The "universal" single-phase or d.c. motor, made in sizes of 1/50, 1/30, and 1/16 h.p., is suitable for use on vacuum cleaners, fans, etc. It has a series characteristic, but its ability to operate on either a.c. or d.c. circuits often outweighs any disadvantages due to inherent variation in speed with load.

For domestic and industrial applications, such as electric washers, ironers, etc., split-phase induction motors are available. Twice full-load torque is exerted at starting, and a tumbler switch is the only control necessary. This type is not generally used above the 1/4 h.p. size, and is most suitable where the load at starting is not excessive.

The Repulsion-start Motor

The repulsion-start induction type is most suitable for refrigerator, oil-burner, pump, and similar heavy duties requiring frequent starting; it is made in 1/4, 1/3, 1/2 and 3/4 h.p. sizes. About three times full-load torque is exerted at starting, and the speed is constant under widely varying loads, the only control equipment necessary being a double-pole switch.

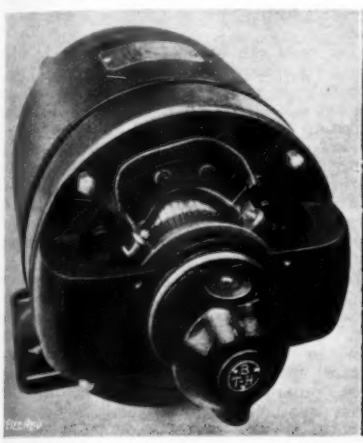
Motors for working on d.c. circuits only are built in sizes of 1/8 h.p. upwards, and are suitable for all general applications. They are compound wound, and can be switched directly on to the line without the use of a resistance.

Winding and Testing

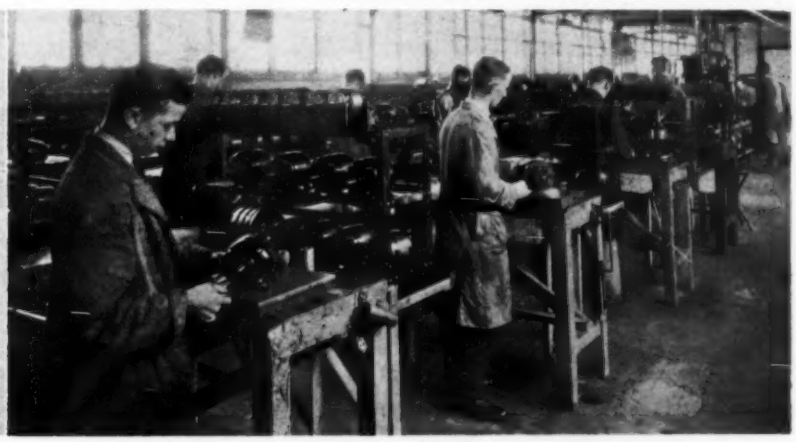
These motors are manufactured at the company's Coventry works. A special stove enamelling plant is installed for dipping the endshields, which are then carried by a slowly moving chain conveyor over a number of heating jets by which they are dried. When machined the parts are conveyed to a central store which feeds the winding and assembly departments.

Most coils are wound directly into slots in a laminated core, but d.c. field coils are former wound and then insulated with tape, the complete taping occupying about 30 secs. After the components have been wound, and the armatures and rotors fitted with commutators and tested, the windings are vacuum dried for four hours to remove any trace of moisture. They are then impregnated with an oil and water resisting insulating varnish, and baked.

Tests on light and full loads for temperature rise, noiseless running and balance, speed and horse-power, are carried out; some types of motors are tested five hundred times in starting and stopping. Each machine is subjected to a careful scrutiny in the Final Inspection Department.



A ¼-h.p. a.c. motor showing brush gear and short-circuiting device



Assembling B.T.-H. fractional horse-power motors

It is started as a repulsion motor, but at a pre-determined speed the commutator segments are automatically short-circuited, and the machine then runs as an ordinary induction motor. These motors are designed to secure noiseless operation, and on all motors other than the 3/4 h.p. size, the brushes are automatically raised from the commutator when the motor has run up to speed; this also reduces brush wear.

The Heavy-oil Engine in 1931

AN informative report on the progress made by the heavy-oil engine in 1931 has been compiled by the Diesel Engine Users' Association. It is based on developments outlined in the British and foreign technical Press, before engineering societies, and in new books.

During the year under review great activity prevailed in the heavy-oil engine world. Three lines of advance stand out prominently, namely, the supercharging of large engines; the application of small engines to rail, road, and air transport; and the successful efforts to reduce weight by new methods of construction and by increasing the r.p.m. and m.e.p.

Electricity Generation

A considerable number of undertakings employed in the generation of electricity have installed high-powered Diesel engines for peak loads, mainly in co-operation with grid systems and hydro-electric power use. Such plant has been erected recently in Germany, at Berlin, Bremen, Minden-Ravensburg; in Switzerland, at Basle, Berne, Geneva, Lachoux-de-Fonds, Lausanne, Lugano, Fribourg, St. Gallen; in Italy, at Naples; in New Zealand, at Auckland; in Spain, at Seville, Alicante; and in Denmark, at Copenhagen. Had it not been for the phenomenal industrial depression prevailing over the whole world at the moment, this list would have been considerably extended, as there is a long list of proposed installations that have been cancelled or postponed.

For this type of installation the double-acting two-stroke system has obtained a clear superiority. Revolutions of this large engine vary between 100 and 220 per minute. Mr. Cassé, in a recent paper before the Association, referred to engines that can be started automatically when certain conditions prevail. The M.A.N. concern has supplied what are called full automatic Diesel electric emergency sets to a number of undertakings, and it is considered that this automatic arrangement has now reached such a stage that it is preferable to storage batteries for emergency work.

Messrs. Harland and Wolff, Ltd., of Belfast, have definitely entered the heavy-oil engine market for land purposes. They are now in a position to give deliveries of engines for generating purposes up to 15,000 kW per unit, and it is understood that large engines for electricity supply undertakings, including foundations, steel frame building, overhead crane, fuel-storage tank, auxiliaries and piping, installed and in running order, can be supplied at a cost below £12 per kW.

Marine Auxiliaries

The diversity of type of marine auxiliary engines is still great, and there is little indication of finality of design. Most of the engines used for this purpose are of the four-stroke cycle type.

The French cruiser *Jeanne d'Arc* will be the first small cruiser fitted with a high-speed oil engine for generating purposes. Two Renault engines, each of 250 b.h.p., 1,650 r.p.m., are being fitted mainly for supplying electricity when the ship is in harbour. The *Deutschland* has oil engines for auxiliary purposes. Heavy-oil engines for auxiliary services have been in use in British battleships for years, and there is no question as to the economy of this form of generator; the reason why it has not been fitted before in a cruiser is that a sufficiently light and compact design has not been available.

Road and Rail Transport

Oil-engined road vehicles are definitely beyond the experimental stage. An experimental Diesel-electric lorry built by T.S. Motors, Ltd., has run some 16,000 miles with a total maintenance cost of 16s.

Regarding rail transport, the necessary combination between railway engineers, makers of oil engines, and manufacturers of some form of transmission gear, electrical or mechanical, has not yet been successfully completed.

Though it appears unlikely that either electrification or oil-electric locomotives will be adopted, for at least some years, on the scale envisaged in the Weir Report, it is probable that both forms of traction will be adopted to a certain extent. Tests of an experimental Diesel-electric car built for British railways by Sir W. G. Armstrong Whitworth & Co. have been made on the L.N.E.R.

In 1930 the Royal State Railways of Siam ordered six 450-b.h.p. Diesel-electric locomotives, four-stroke with eight cylinders, running at 700 r.p.m. The Frichs locomotive works at Aarhus, Denmark, have delivered between 20 and 30 Diesel-electric locomotives.

The "Chirotherm"

Improved apparatus for bloodless surgery

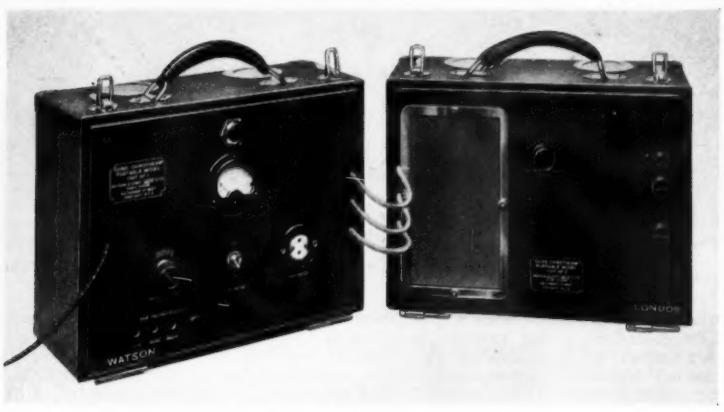
IN its medical application the term "diathermy" is precise and entirely appropriate in the sense of "heating through," since there is a considerable rise of temperature of those parts of the body through which the high-frequency a.c. passes. In surgery, however, the word is a misnomer, for in this case the accompanying temperature rise is appreciable only at the point of application.

Heat is generated by the dissipation of energy in overcoming resistance, and it may be controlled within limits by so adjusting the size of the electrodes as to suitably distribute the current. For surgery the "indifferent" electrode is large, while the active one is usually a knife edge or needle point.

Being relatively small, it thus concentrates sufficient current to form a small arc, which performs the cutting normally done by the scalpel and, at the same time, also slightly coagulates the surfaces of the incision and seals the small blood vessels—hence the term "bloodless surgery."

Electrical Conditions

The most effectual electrical conditions have occasioned considerable controversy. Research by Messrs. Watson & Sons (Electro-Medical), Ltd., seems to indicate that the exact frequency employed is not of vital importance, so long as it is high (of the order of half a million cycles per sec.), nor is it impossible for both cutting and coagulation to be satisfactory when the same wave form is used, provided other conditions are fulfilled.



Portable "Chirotherm" outfit

The main conclusions are that highly damped waves will not cut, but have excellent coagulation or dehydration qualities; moderate damping enables good cutting to be done and can be satisfactory for coagulation also if the voltage and power output are properly adjusted.

Satisfaction has resulted from the abandonment of the tungsten spark-gap generator in favour of the thermionic valve, which is silent, capable of a larger output, and does not need such critical adjustment or skilful use. The surgeon does not have to bother about the machine, so long as he understands the results which accrue from manipulation of the controls.

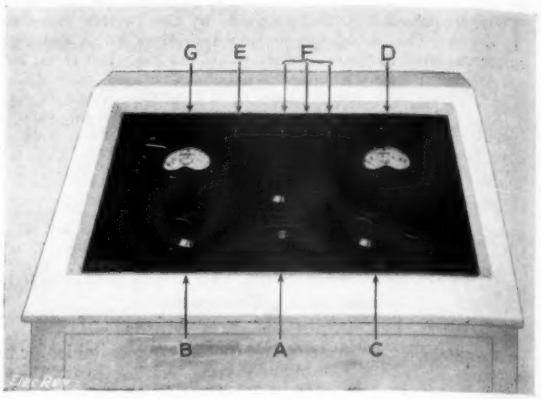
These are simple, and the illustrations show the absence of live terminals: A affords main control of the current output (three positions) for cutting skin, tissue, and coagulation; B regulates intensity for adjustment of the cutting speed, depth of incision, and degree of coagulation; C governs the valve filament voltage, which is set at the commencement of an operation; D is a valve filament voltmeter; E the "indifferent" electrode terminal; F active electrode terminals; and G is an ammeter.

The set is connected to a.c. mains by a three-pin plug and draws an input of from 5 to 8 A, the portable outfit being similar in essentials, but of smaller output. The electrical equipment is entirely enclosed; an input switch and an output foot switch are provided.

Surgical Results

The "electric needle" appears to be definitely replacing the scalpel for many classes of operation. In the surgery of malignances, particularly, the advantages of diathermy are apparent. The tissues are sterilised and the blood vessels and lymph channels sealed. Thus the risk of metastasis is lessened, the comparatively bloodless operation largely reducing the danger of transferring cells from diseased to healthy tissue.

Hæmorrhage is controlled more quickly and conveniently; the arc, while cutting, simultaneously seals the small blood vessels and the larger ones can be coagulated quickly when severed. The consequent reduction of the number of hæmostatic forceps which have to be used and restriction of blood flow increase the surgeon's ability to see and reach difficult cavities, so giving him an additional sense of security.



Hospital model control panel

All these factors tend to shorten the operating time, so that operations which might in ordinary circumstances be considered too radical are brought within the field of practical possibility. Moreover, it is claimed that, generally, diathermic operations are followed by much less trauma, pain, and surgical shock.

For fulguration, frequently described as desiccation, an "indifferent" electrode is not needed. The active one is held sufficiently far from the area being treated to allow the current to bridge the gap in the form of a succession of small sparks, which produce coagulation.

The differing resistance offered by skin, tissue, muscle, and fat, which is dependent upon their water contents, demands variation of cutting current. This is simplified by the convenience of electrical control, which allows considerable latitude, though speed of cutting, depth of incision, and degree of coagulation are of course interdependent. The method of using the electrode is not difficult to acquire, although it is quite different from scalpel technique.

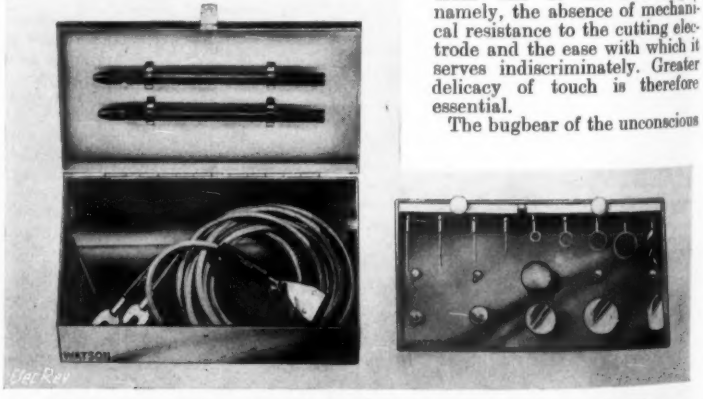
The electrical output is under complete control, fine adjustment being readily obtainable without detracting from the surgeon's concentration on manipulation of the electrode. When not deliberately intensified normal coagulation is very slight (less than one-tenth of a millimetre). The wound consequently heals satisfactorily, leaving a soft narrow scar.

Precautions

The only material disadvantage which has been urged against surgical diathermy arises from one of its advantages, namely, the absence of mechanical resistance to the cutting electrode and the ease with which it serves indiscriminately. Greater delicacy of touch is therefore essential.

The bugbear of the unconscious patient's involuntary muscular contraction seems to be dependent to a large extent on electrical wave form, and is minimised by correct design. It has also been suggested that the type of anæsthetic employed may influence this effect, and the necessity of avoiding the use of explosive anæsthetics in the vicinity of a bare electric arc will, of course, be realised.

While it is perfectly safe for the operator to touch the patient with his hand when the current is on, he should avoid a light touch with the tip of, say, one finger, which may cause a minute spark discharge to burn slightly. Also the patient must not make contact with any earthed metal.



Sterilisable electrodes, "Bakelite" holders and connecting cables in a chromium-plated metal case

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Successful Railway Electrification

THE paper which Mr. F. Lydall read at the Institution of Electrical Engineers on April 28th gives a general account of the Bombay suburban and main-line electrification scheme on the Great Indian Peninsula Railway. The first portion sets out the circumstances in which the scheme was initiated, the principal reasons for the decision to electrify the services, the actual and anticipated traffic, and the general programme of carrying out the work.

The second portion deals with the local conditions which determined the design of a good deal of the plant and apparatus. This is followed by brief references to special points in the installation and design of the multiple-unit trains, electric locomotives, track equipment, bonding, sub-stations, transmission system, power station, locomotive shops and car sheds, and system control.

The last two sections contain a number of statistics of operation and notes of operating experience, and the paper concludes with an appendix in which are given for reference the names of contractors and the technical particulars of the plant.

Both the north- and south-eastern main lines have to climb the Western Ghats, forty miles from the coast to a plateau 2,000 ft. above sea level. The ruling gradient is 1 in 37. The length of single-track equipped, including sidings, is 571 miles, or 181.4 route miles. There are fifty-three suburban motor coaches and 153 trailers. The forty-one freight locomotives have an aggregate of 106,600 h.p., and the twenty-four passenger locomotives aggregate 51,990 h.p. The fifteen sub-stations contain 100,000 kW of plant. There is 272 miles of 100,000-V transmission lines, and the power station is equipped with four 10,000-kW generating sets and six 60,000-lb. boilers.

The suburban scheme cost just over £2,000,000 and the whole scheme over £5,000,000. During the year 1930-31 the failures per 100,000 locomotive miles were steam 3.18, electric freight 0.45, and electric passenger 0.21.

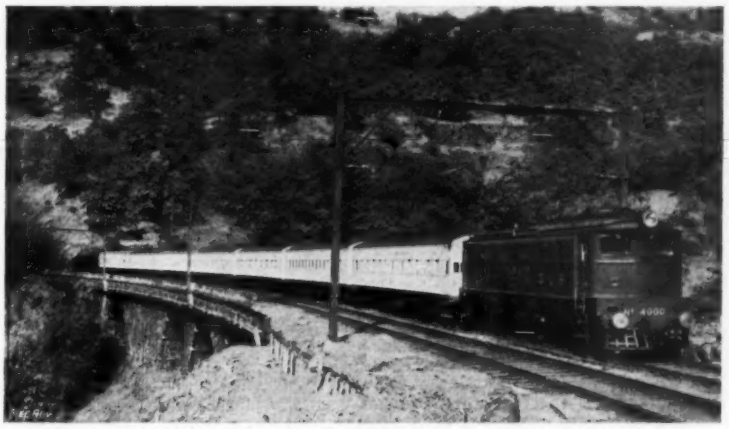
Electricity Consumption

The average energy consumption in terms of power purchased from the Tata companies for the suburban passenger services worked by multiple-unit trains is from 77 to 79 watt-hours per ton-mile. On three sections regeneration is used and has been well worth while. A proportion is absorbed by ascending trains; the remainder is converted into a.c. in seven sub-stations and returned to the transmission lines. On an average about 4.5 per cent., or 2,700,000 kWh per annum, of the input to the rotary convertors is returned.

Apart from initial mechanical gear trouble, the multiple-unit train equipments have given satisfactory service. The freight locomotives have behaved very well and the passenger locomotives have a good record.

Bird guards have had to be fitted to the track overhead structures, but no signals have had to be altered due to obscuration. Some modification has taken place in the suburban sub-stations, but there has been a complete absence of trouble in the eleven main-line sub-stations, which is very satisfactory considering the special features of e.h.p. supply, regenerative convertors, automatic operation, and supervisory control.

The power station's principal feature of interest is the excellent result obtained from the supplementary oil-firing of the boilers. The fluctuations of the load are, as anticipated, sudden and considerable, but have given rise to no difficulty as the overload output of the boilers is obtainable almost at a moment's notice. The flexibility of operation is remarkable and, what is specially important, is obtained at very small cost. The price of oil fuel is naturally higher than the price of small coal.



An electric train on the Bhore Ghat, G.I.P. Railway

Regeneration

The return of regenerated power to the station is not infrequent. The surplus is usually absorbed by the station auxiliaries, but if the input is substantially in excess of the auxiliary load the generators begin to speed up. Before they reach the limit set by the emergency governor, a frequency relay at Karjat closes and a tank resistance capable of absorbing 1,500 kW is connected to the overhead line. On one occasion the frequency relay failed to act, without, however, any serious results, the power-station staff opening the feeder circuit-breakers before the rise in speed became excessive.

Heaviside's Work

THE twenty-third annual Kelvin Lecture was delivered at the Institution of Electrical Engineers on April 21st by Dr. W. E. Sumpner, whose subject was "The Work of Oliver Heaviside," which ranged over the whole of electromagnetic theory and practice.

Oliver Heaviside was born in 1850; all his early work, from 1872 to 1882, dealt with normal problems in telegraphy, such as the induction balance, duplex circuits, and so on, and Heaviside appeared to have been associated with the introduction of quadruplex telegraphy. He retired early, but continued throughout his life to work at telegraph problems.

Oliver Heaviside was an example of the rare case of a combination of great theoretical and mathematical powers with a bias of mind which was strongly practical. He was entirely self-trained. All his papers up to 1882 dealt with telegraph problems by normal methods, but after that date he dealt with those problems entirely from the point of view of waves, *i.e.*, as problems in directed radio-telegraphy. Indeed, Heaviside was the first radio-telegraphist.

His work consisted of two main parts: (1) the simplification of Maxwell's theory and the improvement of mathematical methods for use with it, and (2) the design of a transmitting line or cable to convey electrical signals perfectly at high speed. One great feature of Oliver Heaviside's work was his clearness of expression and resource in suggesting excellent new words to express novel technical quantities.

Improving Cable Communication

In dealing with his cable problem, Heaviside worked entirely alone, and he had to deal with a mathematical problem so new and so difficult that no existing form of analysis was suited for it. He evolved an experimental process which found no favour with mathematicians, because it was something which no one could understand and which Heaviside himself did not profess to explain. The only men whom Heaviside hoped to interest were telegraphists, and he had to struggle against a fixed erroneous belief of the whole profession. Kelvin's KR law ignored the self-induction of the line in ocean telegraphy; for Kelvin's purpose that was justifiable, but as signalling at higher speed became a want the KR law ceased to apply. Heaviside advocated the increase of the self-induction of the line, an idea utterly opposed to the prevailing notions of the time, and the men who most understood his ideas were not necessarily in the highest positions in the telegraph world.

The Loading Coil

The whole industry at that time was in the hands of a Government Department reluctant to try expensive experiments. Heaviside never had a chance to put his theories to the test, although he did suggest practical ways of increasing the self-induction of the line several years before it was actually tried, in France and America. Indeed, although Heaviside's analysis was so obscure, had it not been for his power of making his views clear in simple language it was doubtful whether during his lifetime the loading coil would have been invented.

Much was done between 1883 and 1885 by Heaviside and Poynting, working independently, to make clear the extent of Maxwell's theory. All those problems involved the action of matter, the properties of which were a never-ending source of controversy. In 1891 Heavisde summed up his work on the Maxwell theory in a single paper which was published by the Royal Society in 1892.

Heaviside's object was to design a telegraph cable and transmit signals perfectly at high speed. It was commonly supposed that he solved this problem by his operator method, but that was only partly true. Heaviside's problem of high-speed telegraphy, including the more complex case of telephony, was that of finding conditions to be fulfilled by the transmitting

line and by the receiving apparatus in order that a pulse of potential applied at one end of the line would, in spite of the interference of matter, pass over the line like a pulse in a ray of light without leaving a trace of energy behind to interfere with any successive pulse. A large part of Heaviside's work, therefore, was directed to the study of reflected waves, his whole object being to find out how to avoid them.

The Heaviside Layer

The reflecting layer in the upper atmosphere was suggested by Heaviside to explain the fact that radio waves curve round the earth's surface. In this part of his work, however, he realised that what he had to consider was not the behaviour of a complex wave, but that of a single pulse. This pulse was a solitary wave advancing over a dead-smooth sea, and Heaviside wanted a form of mathematics which would enable him to ride on the front of the wave and study what happened to it when it met obstacles, and he failed to find in any mathematical work any form of analysis suitable for his purpose.

Heaviside wanted to study the first pulse which travelled beyond the ridge, and in order to find out what happened to it he had to do two things: first, to express a pulse in mathematical language, and, secondly, to deal with the pulse. For the first he used his unit function, and for the second he used his operator method. The two were quite distinct, although it was often assumed that they were essential parts of one method. Heaviside dealt with each of them in a way which showed his resource.

His actual analysis was always simple, clear, direct, and compact. His writings did not exhibit the orderly arrangement of a text-book, but it was his characteristic never to leave a definite problem unfinished. He used his operator method throughout his work, and did not trouble to give anywhere a complete definition of it. He put the electromagnetic laws into the simplest and most symmetrical forms. He was not writing a text-book for beginners, but was dealing with electrical problems in a series of articles published in a technical journal.

As regarded his electromagnetic theory, Heaviside's work was to simplify the basis, and he developed a mathematical machine specially suitable for use with it. His work on the cable problem did a great deal more than lead to the theory of the loading coil. It showed that ordinary cable telegraphy was but a form of directed wave.

His writings were scattered with what might be called diamonds in the rough. The mathematician, however, did not appreciate them until they were worked up and sparkled from every point of view. Many years might pass before this was done, but then Heaviside's reputation, great as it was now, would become yet greater.

Priority of "Loading" Invention

Mr. Ll. B. Atkinson, proposing a vote of thanks to Dr. Sumpner, said that such a lecture was long overdue for delivery before the Institution. Two things were specially associated with Heaviside's name. One was the laws of the electrical circuit, and the other was the "Heaviside layer," and on both of them there had been a good deal of controversy as to priority. Lord Kelvin himself had stated before the Institution that certain quantities in relation to the law of electrical circuits had been completely worked out. The subject of inductance in telephone circuits had also been a matter of very acute controversy, and to Heaviside it was a great embitterment that nearly everybody spoke of the Pupin coil. The value of the loading coil was indicated by a statement of the vice-president of the American Telephone Co. that its use had saved an expenditure on cables amounting to some £25,000,000.

Sir Thomas Purves seconded the vote, and Sir Oliver Lodge supported it.

Where Great Britain has Led

"GREAT BRITAIN and the Future of Electricity" was the subject of the Huxley Lecture which Mr. C. C. Paterson delivered at BIRMINGHAM UNIVERSITY on April 26th. The speaker said that Great Britain has been the pioneer in taking a long and broad view of the future, and has planned accordingly. The British telephone system is one of the models of the world. The making of long-distance telephony easy, cheap, and certain has required a courageous policy in the liberal supply of expensive electrically balanced cables. The "no delay" plan is already in operation and will result in 72 per cent. of the calls being completed within one and a half minutes and a further 12 per cent. within ten minutes.

Broadcasting Development

This country has organised broadcasting technically and politically on a basis which is both courageous and novel, and has since been followed by other countries. There are five main stations, each with its two "range" circles. London from Brookmans Park, Midland from Daventry, North England from Moorside Edge, Scottish from Falkirk, and West of England from Williton, designed on a consistent scientific principle for the minimum of interference with each other and with neighbours.

The powers of the stations and the distances between them have been so chosen as to provide sufficient signal strength to make fading tolerable with the particular wavelengths used within fifty miles of each national and eighty miles of each regional transmitter.

A third effort of organisation is that of the supply of electric power, probably the most heroic of these three pieces of national electrical organisation. It certainly goes much farther than any other country has yet ventured, and our great experiment is being watched with the keenest interest.

Those who are ready to hand down to posterity a non-standard system should have overwhelmingly strong technical as well as financial reasons for doing so. For if standardisation is otherwise desirable, the longer it is deferred the more difficult and expensive it becomes to achieve. Great Britain has always been seriously handicapped by the variety of voltages for which every type of appliance must be made and stocked, and every day which passes makes ultimate unification more difficult and expensive.

The costs of standardisation and unification have been increased by the long delay, and the expense has to figure as an overhead charge on the cost of electricity to-day. It is a charge which has to be carried partly by intrinsic economies which result from unification and partly by levying, as it were, a tax on every kWh of electricity sold. The more energy sold the smaller will be this tax per kWh.

Ease of Control

Broadly, electricity's value depends on its transportability and ease of control. Free electron devices, such as valves, rectifiers, photo-cells, etc., enable nearly everything that man now does by virtue of what he sees to be done automatically. Extension of its field of service will follow elaboration of these two qualities, but progress does not solely depend on the engineer or on the physicist. It will depend on the extent to which the lay public develops the electrical sense, employs electricity for everything, and provides liberally in the home for its use.

The majority of private houses are not infrequently equipped by those who have had but a narrow electrical vision. The improvement and cheapening of all electrical devices and the intensive study devoted to them both by manufacturers and distributors, however, are causing an extension of electrical activity actually at a moment when nearly all other activities tend to shrink. Is not the secret to be found in the circumstance that this is the first time in the history of our civilisation when women can see an agency which gives them an opportunity substantially to reduce the daily drudgery which is so often their lot?

Do the Regulations Need Revision ?

FURTHER consideration was given to the regulations issued by the Electricity Commissioners with regard to overhead lines at a meeting of the OVERHEAD LINES ASSOCIATION on April 20th.

Mr. G. W. Molle (hon. secretary of the Association) pointed out that the Council had suggested to the Electricity Commissioners in May, 1931, amendments to various details in the Regulations, as the result of replies to a questionnaire circulated to members at the end of 1930. The Commissioners had replied that the spirit in which the recommendations were offered was appreciated, and that if and when any revision of the Regulations was made those recommendations would be given consideration. Mr. Molle suggested that similar questions might again be put to the members of the Association, to be answered in the light of experience gained since that time.

"Second Comers"

Mr. W. Fennell said that in the main he saw no reason to withdraw the proposals made by the Association, but his views with regard to one or two details had been modified. He disagreed with a suggestion that one of the alternative methods of crossing roads should be deleted from the Regulations. He preferred duplicate insulators supporting duplicate conductors, tied at intervals not exceeding five feet, to a catch guard which he considered to be an abomination.

He supported heartily the Association's recommendation to amend Regulation 5 to make the second comer provide against danger involved in approaching too closely to existing overhead wires. The Post Office had already given way on that point, and at least there should be provision for arbitration. He adhered to the Association's proposals to reduce the factors of safety for rural lines.

As to height, if the Commissioners would state simply that the high-pressure conductor must be 20 ft. high and earthed returns, say, 2 ft. below it, conditions met with in practice would be satisfied. A clearance of 2 ft. should be sufficient, and engineers should not ask for more than they needed. He also pointed out that if a return wire were broken, one end of it would become alive at full pressure. The Regulations did not provide against that, and he suggested that if, at the end of a spur, the Commissioners allowed the wire to be at a height less than 20 ft., engineers would offer to place an earthing device at the transformer end which would break down at, say, 500 V maximum. There would then be greater safety than was attained under the existing Regulations.

He could not see any necessity for numbering the supports consecutively. A danger notice should be sufficient to prevent unauthorised climbing in a country where everybody was supposed to be able to read; barbed wire entanglements were bad for the linesmen. Some of the Post Office requirements

amounted almost to regulations, and were a source of expense to electricity undertakings whose lines crossed P.O. lines.

Temporary Acquiescence Proposed

Mr. Sumner moved a resolution to the effect that the Commissioners' Regulations be accepted in their entirety by the Association for a period of three years, rather than the amendment of small details should be recommended from time to time. All the proposed amendments, if accepted, would not result in reducing the overall cost of a line by one half per cent. The average of from fifteen to twenty actual cases in which Post Office lines had been placed underground, ranging from 2-wire to 30-wire circuits, was £27 per crossing; the estimated cost of placing the power cables underground in those various cases had averaged £89 or £91; and the cost of placing a guard between a power line and a Post Office line had averaged £53. He regarded the use of double conductors at road crossings, etc., as utterly unsound and unsafe; it was safer to have a single conductor, even without the insulators.

Mr. R. Borlase Matthews did not agree with Mr. Sumner's views against the proposed amendments. Factors of safety up to nine were factors of ignorance. The amendment of the Regulations should be referred again to the Association's special committee for further revision to be proposed to the Commissioners as representing the opinion of the Association, which was backed by 160 of the 235 undertakings in the country dealing with overhead lines.

Mr. P. D. Morgan said that the three years or so since the Regulations were published was not a sufficiently long period upon which to base conclusions, because during that time they had not experienced in this country any really bad snowstorms together with high winds.

Major T. Rich did not favour use of duplicate insulators and double conductors at road crossings. If they were fastened together at intervals of 5 ft. they formed a series of hammocks to carry snow and sleet. In every other country cages were to be seen only in museums, and the money spent on such things ultimately had to be found by the consumers.

The Regulations and Costs

Mr. Sumner said that a line of 0.25 copper which would carry, say, 1,000 kW at 11,000 V or 3,000 kW at 33,000 V, could be constructed for considerably less than £350 per mile.

Mr. Jocelyn Swan, President, said he had erected a considerable length of 0.1 cable at 11,000 V, complying with all the Commissioners' Regulations, at a cost of £375 per mile, which was more favourable than £350 per mile for a 0.05 line.

Mr. Bartholomew referred to the International Electrotechnical Commission, and said that a British Engineering Standards Committee had obtained all the overhead lines regulations it could, from all parts of the world, and it was found that the British Regulations were the least onerous of them all. It might be best, as suggested by Mr. Sumner, to postpone proposals for amendment for another three years, when the Commissioners could review the whole matter. There had not been a severe storm for many years, and the Commissioners were wise in keeping to the factors of safety which they had laid down.

Mr. S. N. Wilson understood that the Central Electricity Board would allow a 33,000-V line to cross under its primary lines if there was a vertical clearance of 15 ft., and 11 ft. clearance under all conditions from its poles.

Novel lighting "pylons" on the Southend esplanade

The President disagreed with the view that they should be satisfied, for the time being, with the Regulations, and urged that they should do all they could to cheapen the erection of overhead lines, especially those to small hamlets, where there was not a large potential revenue.

There was no seconder of Mr. Sumner's resolution that the Association should take no further steps for three years.

The Prevention of Dust Emission

METHODS of removing "dust" from the flue gases of electric power stations are reviewed in a short paper which Mr. J. Mayer read before the North-Western Section of the Institute of Fuel at Manchester on April 22nd.

Analysis of a number of installations has shown that with stoker plant up to 65 per cent. of the dust is deposited in the combustion chamber, boiler, &c., that discharged containing from 15 to 35 per cent. carbon. With pulverised-fuel firing up to 30 per cent. is similarly deposited, that discharged containing from 5 to 15 per cent. carbon. With powdered coal concentrations up to 4 grains per cu. ft. emitted are common, but with stokers the concentration rarely exceeds one grain per cu. ft., unless the ash content of the coal is very large.

At times of soot blowing the concentration may rise to 15 grains per cu. ft. The net efficiency of collection should not be debited with particles of the sizes which constitute clouds and smoke; that is, smaller than 10 microns.

Electrostatic and Cyclone Methods

Cleaning by pre-treatment of the coal is the most satisfactory method of dealing with the problem. For large-scale operations the settlement and bag filter systems are not suitable. Electrostatic precipitation, which needs about 1 kWh per 100,000 cu. ft. of gas treated, has the disadvantage of declining efficiency as the load falls.

Centrifugal collectors give the gas a rotary motion by tangential admission to a volute or by the use of guide vanes. Rising efficiency is obtainable at the expense of greatly increased draught loss. A number of cyclones are usually arranged in groups, in series and parallel, so that the most favourable combination for maximum efficiency with minimum draught loss can be obtained; this appears to be effective.

In this country two methods of gas washing have been applied to large-scale power station work. From 2 to 3 gallons of water is used per 1,000 cu. ft. of gas washed, the draught loss being of the order of 1 in. water gauge. One system uses wetted baffles arranged vertically in staggered rows. They are hollow, octagonal in exterior section, each face being alternatively concave and convex. Water from a top supply tank overflows to trickle down over all the faces of the baffles. By the sinuous movement imposed on the gas stream by the staggering of the baffles, the maximum surface of the gas is exposed to the action of the water film.

Two-stage Washing

The second method is two-stage washing. The gases are passed through primary sprays which atomise the water and produce a condition of mist at the entrance to the washing chamber. The gases passing through this mist absorb water vapour and are rapidly cooled down to dew point when the evaporated water is recondensed and produces a primary deposition of dust particles. The secondary sprays are formed by high pressure jets of water impinging on flat plates and set up a curtain of water which washes down the wetted dust. The gases are finally passed through a number of rows of staggered V-shaped baffles, the faces of which are continuously washed down by a supply of water from an overhead tank.

While each method has defects, a combination of two can be satisfactory. The author suggests dry cyclonic collectors followed by washing. If placed before the induced draught fans, this arrangement will reduce abrasion and also fan power, due to the lowered temperature of the gases.

Electricity in Rural Districts

IN a paper which Mr. W. Burton read at the Birmingham Electric Club last week, mention was made of the tendency of workers to live away from the main towns due to the improved means of transport of recent years. Many firms had developed their activities farther afield, and this had led to the necessity for provision of the same amenities of life in the country districts as had been obtainable hitherto only in towns.

The lay-out and protection of main lines, subsidiary lines, and final feeders, and the characteristics of line insulation and insulators were dealt with. The author then mentioned substations, and stated the leading requirements of transformers for rural supplies, the chief of these being reliability, to which price (although the important consideration) should be subservient, in order to reduce the losses due to possible breakdown. Automatic sub-stations were referred to as being of considerable use in outlying districts where the telephone system was the only method of notifying faults. The question of telephone communication over a widespread system was dealt with.

The advantages and disadvantages of various types of fuses available for the protection of transformers was then discussed, and the results of tests taken were given. The author gave attention to the general rural industries, especially from the point of view of the farmer, putting forward many interesting examples of agricultural machinery, the advantages of electrical operation of such machinery, and the attitude of the farmer in this matter.

The I.E.E. Summer Meeting

Harrogate Spa—an attractive headquarters

APART from civic and social functions, the programme of the summer meeting of the Institution of Electrical Engineers (May 30th to June 3rd) includes visits to a large grid sub-station, three important generating stations, three manufacturing works, and a colliery.

Not the least attractive feature of the meeting is the fact that the headquarters town of Harrogate, delightfully situated on the Yorkshire moors, is a spa whose palatial baths are renowned the world over.

An almost endless variety of different treatments is available and the bracing moorland air makes it a wonderful health resort. In the Harrogate Royal Baths the earliest medical electrical treatments were given as part of the curative process. The d'Arsonval high-frequency apparatus was introduced as far back as 1897, as well as electric light baths. The electro-therapeutic section of the spa has been gradually increased since then and it is now a pre-eminent exponent of this method of treating suffering humanity, especially as it is almost

A diathermy treatment room at Harrogate

invariably used in conjunction with the natural mineral waters, which are unique in quality and quantity.

The Harrogate electricity undertaking has been supplying electricity to the area since 1897. The number of consumers has now reached a total of 10,000 and the kWh sold last year exceeded 11 millions, while the financial result, after meeting all interest and sinking fund charges on capital, showed a net profit of £16,053. The works is equipped with modern generating plant, the latest addition being a 10,000-kW Parsons turbo-generator and two Yarrow 50,000-lb. boilers.

The Old Sulphur Well, Harrogate

The area of supply of which Mr. Neil McLean, borough electrical engineer and manager, is in charge has been considerably extended by two recently acquired Orders and now covers an area of 200 sq. miles. A bulk supply is also being given to the City of Ripon, with an additional area of 90 sq. miles. The whole of the rural area is being rapidly developed by overhead lines, and at the present moment Harrogate is erecting a section of thirty miles and Ripon is erecting ten miles, bringing the combined total up to eighty-five miles.

The neighbourhood is noted for its scenery and historic interest. Sport and entertainment, both indoor and open-air, music, and excellent shopping facilities are enjoyed by residents and visitors alike. In short, Harrogate is hard to beat as a holiday resort combining cures of unexcelled variety and restfulness.

Members of the Institution who desire to take part in the meeting but have not yet sent in their applications should do so without delay. The railway companies in Great Britain have agreed to supply members of the party with railway tickets to and from Harrogate at two-thirds the ordinary fare.

Condensers for New Zealand

THERE are said to be about 30,000 farms in New Zealand and it is estimated that 900,000 cows are milked twice daily by machinery. The Electric Power Boards which supply electricity to the farms have to pay for the energy they acquire from the Central Power Board on the basis of maximum demand kVA, and it is therefore essential that the power factors of the distribution systems should be maintained as high as is commercially practicable.

Maximum economy is obtainable when the power factor correction is effected as near to the motor load as is possible. With this object the Thames Valley Electric Power Board (N.Z.) decided to install 2,000 condensers on the farms in its area of supply. Although the condensers will remain the property of the Power Board, they will actually be connected to the consumers' motors on the farms and switched on and off with the motors. By installing the condensers in this way voltage regulation on the system will be materially improved and there will be a substantial saving in losses in transmission, quite apart from the reduction of the kVA charge due to the higher power factor which will result from their installation.

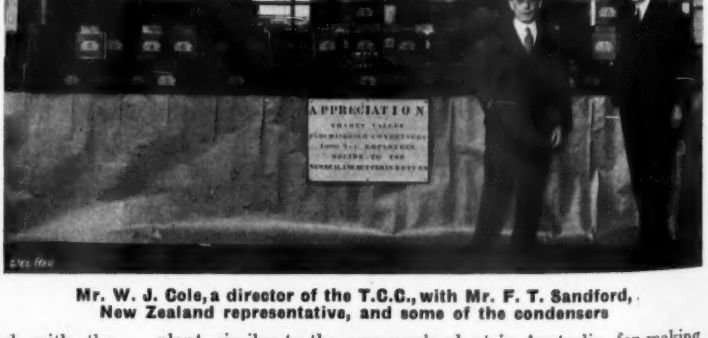
This important contract was recently awarded to the Telegraph Condenser Co., Ltd., in open competition with other British and foreign manufacturers. The condensers are being made at the company's North Acton works. They are all alike; type F, of 0.5 kVA each, with a conduit top and six terminals arranged for parallel 230-V single-phase or star 400-V three-phase connection direct across the motors.

Already over 6,000 kVA of T.C.C. static condensers are in operation in New Zealand, and with the object of fostering reciprocal trade the company recently arranged a meeting of its workers at which it was unanimously resolved to purchase New Zealand butter in return for the substantial business done with that country, more particularly from the Power Board associated with the butter-producing area.

In order that dairy farmers in New Zealand may know individually of this effort on the part of the Condenser Co. to encourage inter-Empire trade, the following words are inscribed on each condenser :—" Appreciation : Thames Valley purchased our condensers. 1,000 T.C.C. employees decide to use New Zealand butter in return."

For over a quarter of a century the Telegraph Condenser Co., Ltd., has concentrated on the manufacture of electrical condensers for all purposes, and it has been responsible for some of the largest installations at home and abroad.

Among the more interesting types are the wet and dry (aluminium) electrolytic varieties, and the numerous insulating materials employed include " Micalex," a compound of mica and glass which resembles slate and is particularly suitable for high-frequency work. There is a complete " Bakelite "



Mr. W. J. Cole, a director of the T.C.C., with Mr. F. T. Sandford, New Zealand representative, and some of the condensers

plant, similar to the company's plant in Australia, for making the familiar green moulded cases. Each individual condenser has to pass at least five tests during assembly.

In the shops one noticed several 300-kVA condenser banks which are being made for the Central Electricity Board. They are to be used as harmonic shunts, and are built up of a large number of series-parallel units (each fused individually) held in wood frames, which are contained in oil-filled tanks for use out of doors; outwardly they resemble transformer tanks.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

The Resistance of Earth Plates

I was very interested in the article "Earthing in Rural Areas" by Mr. T. C. Gilbert, which appeared in the ELECTRICAL REVIEW of April 22nd, as I have made similar tests to find the resistance of earth tubes, plates, &c., in areas where low resistance earths are exceptional.

An average value for earth tubes is about 150 ohms; the lowest value obtained was 30 ohms and the highest 250 ohms. The highest value was on a local water supply involving pumps, tanks, &c.; this bears out Mr. Gilbert's contention that such earth connections are of very little value.

In investigating a fault on a lead-sheathed installation connected to earth by a tube, the leakage current (as shown by the meter) was observed to be decreasing in a manner that probably followed a logarithmic law, this possibly being due to temperature rise, or possibly polarisation.

The only protective device of the kind mentioned in the article that I have yet seen was fitted to an ordinary dwelling house. It was bonded to earth by a tube of high resistance, and proved its utility from the first against rises of potential, due to faulty apparatus.

Bedford, *April 23rd*, 1932. W. H. STIMSON.

Power Point Costs

Might I suggest, as an electrically minded householder, in no way connected with the trade, that the high cost of installing extra power plugs is holding up a substantial volume of trade in electrical appliances?

Very few houses are equipped with sufficient plugs at the outset to enable much electrification to be carried out, and it is little encouragement to the man with a few pounds to spend on electrifying his home, particularly when it is a rented house, as in my case, to find that the cost of the necessary plugs is likely almost to equal that of the appliances. Personally I am prepared to purchase at once two fires, an electric water heater, an electric clock, and probably other appliances, but I have the strongest possible objection to paying from £2 to £2 10s. for the first plug, and between £1 10s. and £2 for subsequent plugs, which is apparently a universal charge in this district.

It is of little use to condemn the amateur electrician unless you put safe and reliable installations within his means; nor can you hope to make proper headway with your sales of electric clocks, fires, radio sets, and other appliances until the cost of installing the plugs which they necessitate is brought down to a figure within the ordinary man's reach.

Manchester, *April 20th*, 1932. TENANT.

Hybrid Cookers

I am sorry if Mr. F. Risch misunderstood my letter which appeared in the ELECTRICAL REVIEW of April 15th, as my object was to show that his idea had been tried and not found wanting so far as the combination of gas and electricity was concerned. Experiments with hybrid cookers have not been carried farther so far as I am concerned, as those I have dealt with more recently have been of one or other thoroughbred kinds.

It seems unlikely that hybrid cookers will ever be much used as there are conflicting interests involved and so many cookers are on hire.

Sheffield, *April 23rd*, 1932. H. B. LEIGHTON.

Is the National Register a Failure?

I submit the answer to the above question is that it is, and always will be until registration is compulsory. I base my argument on the fact that the members registered in England, Wales and Northern Ireland number 1,377. The E.C.A. has a membership of 1,272, so that the Register has a membership of 105 more. I should have thought that every member of the E.C.A. was registered, but I find that there are actually 431 members of the Association who are not, so this makes the actual gain to the Register 536.

It is surprising to anyone at the present time, when power lines run all over the country, that in my own part of Yorkshire, over an area of 4,000 square miles, there are only 23 registered contractors (Harrogate 11, York 7, Scarborough 2, Malton 1, Pickering 1, and Keighley 1), or about one qualified electrical engineer to 170 square miles, and yet if there is, say, a ten-light job going, flies round a honey pot are nothing to it.

If I were to put the number of persons *posing* as electrical engineers for this area at 2,300, I should possibly be near the mark. The example which the Register gets from London is not a good one as there are 176 registered contractors and 174 members of the E.C.A.; 68 of the latter are not registered, so the Register has really gained 70 members. Fancy 70 recruits from London, the hub of the universe! Contrast this with Manchester proper, where there are 106 registered contractors and 42 E.C.A. members, only four of whom are not registered, which leaves 68 recruits. Where does London, having regard to its size, come in when this is considered?

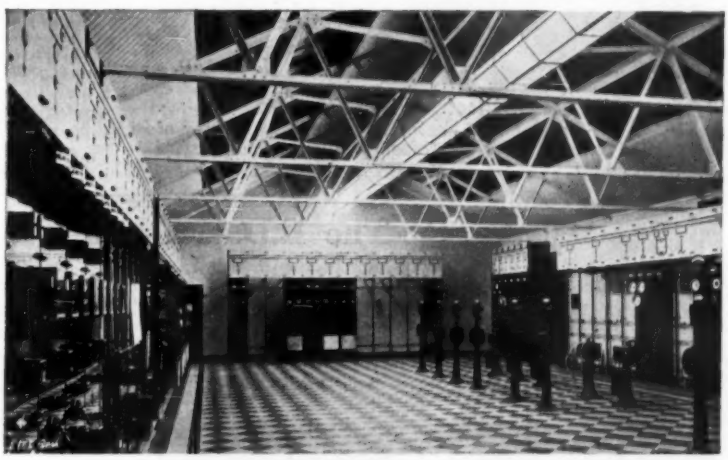
I have already said that the number of registered contractors is 1,377, and if Northern Ireland (28) is left out, the number for England and Wales is 1,349. If anyone will take the trouble to draw a line just above Nottingham across the country, it will be observed that the area to the north of this looks, and is, very small, compared with the area to the south, and yet there are 686 registered contractors in the northern part and 668 in the south. These figures are nothing for the south to be proud of, nor for the north, for that matter, in what should be a compulsory national movement.

In the area of Yorkshire which I have mentioned, there are two towns whose interest in the electrical cause contributes one registered contractor and one member of the E.C.A.—Whitby and Bridlington. Does anyone suggest that these two are the only electrical contractors in the area? Also in the area from Harrogate to Darlington, including Ripon, Knaresboro' and Northallerton, there is not one single qualified firm, unless it is a branch of a concern in another town. I am quite sure that if registration was compulsory we should have a rush to get in from these places.

We are constantly being urged to alter this unfortunate state of affairs, but with what effect? I am informed that a plumber must be registered and authorised by a corporation before he is allowed to install water pipes, but in our case no corporation bothers who does the work. It cannot be said that the plumber is dealing with anything dangerous, but from the number of deaths that are reported electricity cannot be called harmless.

Unfortunately, through the advent of wireless apparatus, it has come to be considered that the trade of electrical engineer is quite easy, but anyone who has been engaged in it for a large number of years, as I have, knows very differently. The existing state of things makes it uneconomic for a legitimate trader to be in the business, and the position is worsened by the number of wiremen who are put out of work through the competition of the "illegitimate" contractor.

Harrogate, *April 21st*, 1932. R. FALSHAW.



Special Holophane lighting in the West Ham Corporation's control room, Canning Town. **(See page 640)**

High-voltage Sub-station Insulators

It appears that this question interests many people. Mr. M. W. Singer is astounded that one of your correspondents permits himself to assert that the cylindrical post type insulator is not as mechanically strong as the cemented multi-part pedestal type, but I am not aware that any comparative tests have been conducted for the particular contract in hand.

London, S.W., *April 22nd*, 1932. L. A. BURNIER.

In your issue of April 22nd Mr. Singer stresses breakdowns of multi-part insulators which, far from dismissing as a myth, none deny and all deservedly criticise.

Proceeding from these failures, which he attributes to cement as such, but which actually are due to poor cement and poor assembly, Mr. Singer finds impervious skins on those manufacturers who happen to supply cemented insulators that give every satisfaction in service. Then, because the cylindrical insulator has either no service records or has records in which he can find no pride, he points triumphantly to the Sydney Harbour Bridge! This is a queer sequence suitably capped by the fantastic statement that insulator records are futile.

As an example of descriptive writing, Mr. Singer's letter is entertaining. Technically, insofar as it refers to my letter, it but reiterates Mr. Hatton's very questionable claim that cementless insulators are better than cemented insulators. The theory of probabilities applied to insulator depreciation is apparently so novel to Mr. Singer that he imagines it has something to do with philosophy!

This correspondence contains a valuable contribution from Mr. Spencer clearly indicating how thermal stresses are successfully countered in scientifically designed and cemented insulators. Is it too much to hope that the "cementless" school which inspired the article that gave rise to this correspondence will substantiate the sweeping and derogatory statements therein made by some similarly solid technical fare? This would be more in keeping with the importance of the issue raised than a tiresome reiteration that cementless insulators—merely because they are cementless—are better than the cemented types.

London, S.W.1, *April 25th*, 1932. R. C. Andersen.

Condensers or Motors?

Under this heading in your leading columns of April 22nd appears the following comment: "Recently we saw a motor which was installed by a large power consumer because of the makers' claim that it would not worsen the p.f. of the installation. But the happy result was a considerable overall improvement and .85 was indicated under a 'swinging' load which would worry a good many works engineers."

Shouldn't the power consumer have known, or paid someone to tell him, the precise effect on his load of installing that or any other motor? Again, should not the power factor suit the bill and not *vice versa*? I have designed a number of factory installations and have yet to meet the case where, the tariff being on a kVA basis, it has not paid handsomely to correct the power factor to unity, swinging load or otherwise. But not, be it noted, when using static condensers which are advisable in the case of small or exceptional schemes only. Surely, too, the time has come when the large power consumer should be protected from non-technical advisers.

April 22nd, 1932. J. P. S. P.

Domestic Electrical Refrigeration

That the field of domestic electric refrigeration is worthy of cultivation by the electrical trader is amply demonstrated by figures now available in the *Refrigeration Directory* for 1932, an American publication, in which the exports of refrigerators are detailed.

In 1929 no figures were given for the Irish Free State, but the United Kingdom absorbed 6,950 refrigerators valued at $1,078,000. In 1930 the Irish Free State took 229 refrigerators worth $26,784, and the United Kingdom 7,788 valued at $1,077,668. The 1931 figures show 162 to the Irish Free State ($22,967) and 7,980 to the United Kingdom ($1,432,938), with an additional $477,662 for refrigerator parts.

By far the greater volume of this business is in domestic cabinets, such as are now manufactured in this country by several British firms, and are being offered to the electrical trade generally. The close co-operation of the electrical trade with the British manufacturers is essential to secure this home market for ourselves, and the lower retail prices of British machines should help to arouse an even greater demand for electrical refrigeration in this country.

Fallowfield, Manchester, *April 18th*, 1932. Ben Quarmby.

A Good Job!

I notice an advertisement in your current issue calling for an experienced electrician to operate and maintain a suction gas plant and look after mains—"seven-day week, no relief man employed." This man must also be prepared to do house wiring in his spare time and be a strict T.T.

I suggest the following programme for the lucky man who manages to land this job:—Plant and mains, 56 hours per week; wiring work, 47 hours; recreation 20 hours; meals, 10 hours; sleep, 35 hours; total, 168 hours.

I have suggested no less than 20 hours per week for recreation because "All work and no play, &c." For the successful candidate's day I should suggest 4 a.m. to 12 midnight from Mondays to Saturdays with a good rest on Sundays, say, 6 a.m. to 7 p.m. "Early to bed, early to rise, makes a man healthy, wealthy and wise," you know.

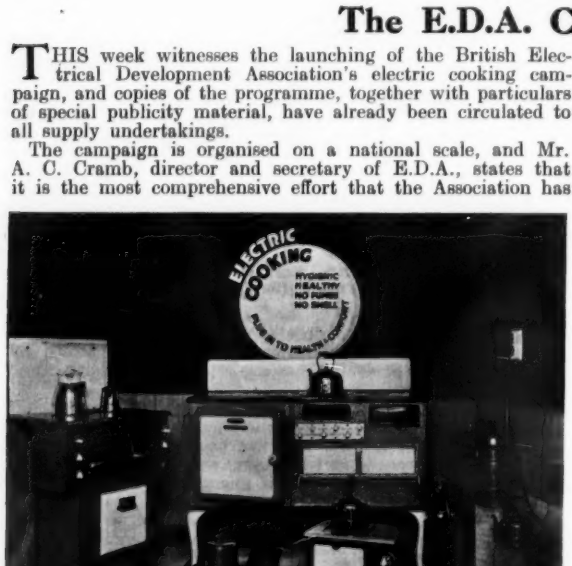
As for being a strict T.T., well who would want to drink on a job like this, especially in Southern Ireland?

Bexleyheath, *April 22nd*, 1932. A. J. Abraham, M.I.E.E.

The E.D.A. Cooking Campaign

THIS week witnesses the launching of the British Electrical Development Association's electric cooking campaign, and copies of the programme, together with particulars of special publicity material, have already been circulated to all supply undertakings.

The campaign is organised on a national scale, and Mr. A. C. Cramb, director and secretary of E.D.A., states that it is the most comprehensive effort that the Association has yet made to promote the development of the cooking load. Its basis is an extensive newspaper and magazine advertising scheme covering England, Scotland, Wales, and Northern Ireland, and provision has also been made for supplementary publicity through posters, pamphlets, newspaper articles, leaflets, and other means.



An appropriate campaign window display

An endeavour will be made to awaken public interest in the advantages of electric cooking, pointing out its chief and most convincing features—its simplicity, convenience, cleanliness, healthiness, reliability and economy. The main "prospect" is the small house where no servant is kept or where a daily servant is employed for the household work.

Co-operation Needed

For many years past electric cooking has made steady progress and the output of electric cookers has been rapidly expanding, in spite of acute and widespread depression. If the electrical industry takes full advantage of this increasing momentum in the popularity of electric cooking, a rapid and material increase in the cooking load is bound to follow.

Past experience has proved that the benefit actually derived by the supply undertakings depends upon the vigour and enthusiasm with which they have supplemented the national effort by publicity work in their own areas. The mere provision of low rates and hiring facilities is not sufficient to create interest and a demand for equipment.

The public needs to be instructed in the advantages of electric cooking; its conservatism of mind has to be overcome; the effect of gas propaganda must be counteracted; and the practical use of electric cooking appliances must be made familiar and attractive. This can be done only by a systematic publicity effort, combined with well-organised service of hire, hire-purchase, and maintenance.

Local Publicity Methods

The precise methods to be adopted by supply undertakings in co-operating with the national campaign will depend on local conditions.

E.D.A. suggests that it may be useful, at the outset, to ascertain the approximate number of consumers who are likely to respond to an organised appeal for the immediate adoption of electric cooking. The most favourable prospects are the owners of small houses where electric lighting and, in particular, other electrical appliances have been in use for some years. A study of records will enable lists to be made out which will, in addition to indicating the scale upon which the local effort should be organised, ensure the most efficient distribution of publicity literature.

The most effective method of driving home the general message conveyed by the national campaign is a series of demonstrations, and a booklet on "How to Demonstrate an Electric Cooker" is being prepared, giving practical hints drawn from the most successful experience. It is a sound rule that there should be a demonstrator for each 5,000 "prospects."

Efforts should be made to arrange special demonstrations before the various local associations of women in the supply undertakings' areas, and immediate steps should be taken to have electric cookers installed at the local cookery schools.

Sample layouts for local Press publicity have been prepared by E.D.A., and articles and paragraphs on electric cooking, together with appropriate illustrations, are available for publication in the editorial columns of the newspapers.

Window Displays

Throughout the campaign the windows of showrooms generally should be laid out with cooking displays, a typical example of which is illustrated. This form of publicity might be extended by renting a vacant shop and fitting it out with a cooker display.

Popular interest in the campaign might also be stimulated by prize competitions, and the following are suggestions which have been proved feasible and attractive: (1) Prizes for the best cake cooked in an electric oven from a specified recipe; and (2) a postcard ballot on the advantages of an electric cooker.

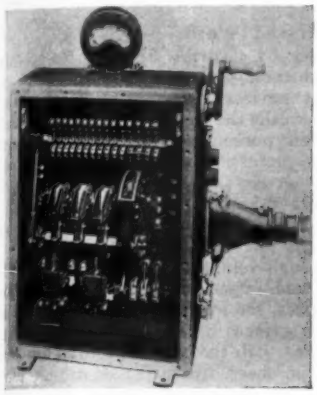
The national campaign will continue until the end of July. The publicity material, which includes posters, poster stamps, demonstrators' handbooks, and special photogravure booklets, is in course of preparation, and will be distributed within the next few days.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Motor Control in Mines

The Metropolitan-Vickers Electrical Co., Ltd., has introduced a combined controller and protective equipment for use with three-phase motors taking up to 75 and 125 A, at 650 V or less, with minimum ratings of 30 and 60 h.p., respectively, and on certain services 100 h.p. Each equipment comprises, in a single case, a magnetically operated contactor-type air-break switch with over-current relays, a drum controller arranged as a starting and reversing switch, and an isolating switch. When the contactor is open the motor is completely isolated. The contacts are of the rolling-butt type, easily renewable, and self-cleaning, and are fitted with magnetic blow-outs and arc-chutes. The contactor opens automatically when the voltage falls below a set value and an electrical interlock secures the return of the controller to the starting position before the contactor can be reclosed after an interruption in the supply. The drum and isolator are interlocked with the contactor, electrically in the smaller size and both electrically and mechanically in the larger. The containing case is of welded boiler plate and has a large removable cover; it is either flame-proof with wide rough-machined flanges, or it may have watertight packing between the case and cover, for normal underground service.



A mine motor controller

The illustration shows an equipment for use with a slip-ring motor. This is similar in many respects to the apparatus supplied for d.c. motors with any type of field winding. For squirrel-cage motors, the equipment can be arranged for either star-delta or auto-transformer starting and reversing and also for stator resistance control. The auto-transformer (when included) is mounted in a flame-proof or water-tight housing on the back of the unit.

Artistic Flexibles

The standard flexibles for portable apparatus seldom harmonise well with the colour schemes of the rooms in which they are used. To remedy this deficiency the 20th Century Electrical, 30, Gerrard Street, W.1, are marketing a range of mottled silk flexibles in various colours. Among the colours obtainable are black and white, red and blue, yellow and white, green and yellow, and a blue, yellow, and plum mixture.

Testing Board for Motor Buses

The accompanying illustration shows a portable testing board, introduced by Mr. F. A. Fitzpayne, the manager, at the central garage of the Edinburgh Corporation Transport Department. The trolley is run up beside any bus giving electrical trouble and the bus dynamo is then connected to the trolley lighting installation. The bus engine being run at normal speed, the performance of the dynamo can at once be seen by means of the two ammeters and voltmeter, all with large scales that can be read without dismounting from the driver's cabin.

In addition, the board carries a bell for bell and battery tests; also a plug for attaching through a lamp to the lighting circuit, should it be desired to apply a 230-V insulation test to any circuit on the bus. By thus taking testing instruments to the bus, the need for removing dynamo, switchboard, or other parts of the electrical equipment for testing purposes is eliminated, with considerable saving of time and labour.

A portable bus-testing board

A Staff Locator

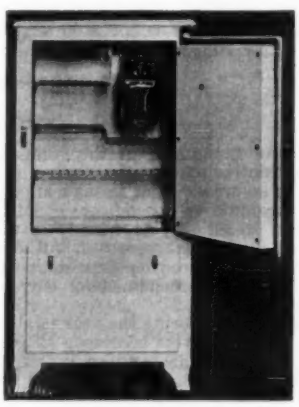
A staff locator permits a telephone operator to get into touch with members of the staff in any part of the works. The new "Klaxon" apparatus enables calls to be made simultaneously to any number of points throughout the building, and twenty distinct code calls are arranged, each individual having his own call. The locator is easily installed, only two light gauge wires being required at each point, and it is operated by six lever switches mounted on the front panel. The locator may also be used as a fire alarm and to give time signals.

The "Klaxon" staff locator

The working voltage is up to 250 V, and a standard Klaxon relay controlled by the staff locator is used to close the circuit. The dimensions of the cabinet are 10 in. by 7 in. by 5½ in., and the weight is 12¼ lb. The manufacturers are Klaxon, Ltd., 36, Blandford Street, W.1.

The "Leda" Refrigerator

A new refrigerator produced by Leda Electric, Ltd., Nelson Street, Miles Platting, Manchester, has a cold control by means of a thermostat, fitted in an accessible position on the outside of the cabinet, which allows a variation in temperature of from eight to ten degrees. The thermostat is provided with a single pole push-pull switch for use when defrosting. The compressor unit is of the single-cylinder type with a reed valve, mounted on a cast base, and is fitted with a "V" belt on a grooved flywheel. Sulphur dioxide with a dry expansion valve on the cooling coil is used for the refrigeration, and the motors are of the repulsion induction type for a.c. and compound wound for d.c.



"Leda" electric refrigerator

The refrigerator has a food storage capacity of 5½ cu. ft. with a shelf area of 8 sq. ft. and is finished externally in sprayed cellulose on steel while the interior is in one piece with rounded corners and is porcelain enamelled. The hardware and fittings are of heavily polished nickel silver. The overall dimensions are: Height, 50 in.; width, 24 in.; and depth, 22 in. Two ice trays are provided, each making ten ice cubes.

An "Apex" Switch-Fuse

An insulated switch-fuse which combines the fuses with the cover has been marketed by the Foster Engineering Co., Ltd., "Apex" Works, South Wimbledon, S.W.19. There are no loose parts, and the cover cannot be left off without breaking the circuit, thus affording protection against touching "live" parts. The fuse wire, which has a break of 1½ in., is enclosed in an asbestos tube. The "Apex" switch has underslung action and all contacts are self-aligning.

"Apex" 10-A switch fuse

The Tariff and Electrical Trade Policy

A TARIFF wall has now been erected, for the benefit of our home industries, and it would be well to consider what should be done next, so that the benefit to be derived may be as great as possible. Owing largely to the low level of prices at which electrical plant and apparatus have been sold in this country during the last few years, there has been little or no importation of goods of these kinds. Accessories and domestic appliances have been imported, and the duties will have direct effect in these cases.

The benefit which the heavy electrical industry may expect to derive from protection is indirect. If the steel and iron industries can be restored to prosperity, the demand for electrical goods by those industries, and by the other industries affected, will receive an impetus. As has been pointed out already, the big purchases made and contracts placed by the Central Electricity Board may be less in the next few years, but the increasing availability of electricity will augment the demand for motors, for transformers and switchgear of moderate size and voltage, of lamps, cables and wires, and accessories, including domestic apparatus.

Co-ordination of Supply and Demand

But the restoration of a condition of general prosperity calls for more than this. It demands the careful co-ordination of production and requirements. The policy of free imports has disappeared. Its departure would be fittingly accompanied by the contemporaneous disappearance of that other legacy from the same source, the policy of *laissez faire*. Much of this has already gone.

History already marvels at the mental attitude of those who, while advocating free imports of grain for the benefit of the hungry masses, paid starvation wages, approved of child labour, and did nothing to prevent the building of back-to-back houses and vile slums, in which the country folk, flocking into the towns, had to dwell.

Nothing is more significant than that, in the lecture bearing the name of Richard Cobden, delivered in this tariff year by M. Caillaux, the famous French ex-Finance Minister, the lecturer should have pointed out the vital necessity of abandoning the mistaken idea that, if every individual seeks what he conceives to be his own greatest good, the result will be the greatest good of the total of all individuals, or the community.

Manufacturing firms must co-operate so that the prices of their goods are stabilised at a profitable level. This level, as the committee appointed to inquire into the matter reported some time ago, should be somewhat higher than the present level of market prices, which has been forced undesirably low. Co-operation involves the surrender of the selfish individual outlook. In lean times, when there is not enough work to keep everybody fully occupied, each strives to get the most for himself. It is too often overlooked that it is generally better for A that B should get an order at a profitable price, than that A should himself get it at a loss.

That Blessed Word ——

Means are available whereby electrical firms can co-operate more closely. Costly schemes, dignified by the name of "rationalisation," are not necessary. In passing, it is worthy of remark that M. Caillaux calls the word a "barbarism," and it is true that it has been worked to death, and has been thoroughly misused in the process. Every section that cannot appreciate the use of another section wants to lessen expenses by extinguishing that other section. The results are ridiculous, and often tragic, as those who remember their *Æsop's Fables* will call to mind.

Co-operative action through voluntary agreement under the auspices of appropriate trade associations will result in the obtaining of profitable prices, the maintenance of quality, and the lowering of costs. Experience has shown, too, that a tremendous goodwill is created with the customers, who are well pleased to continue to purchase from sources which have proved satisfactory. This goodwill may be used in helping forward the next step, which is co-operation between buyer and seller, in research, and in the development of apparatus to meet new requirements.

The immediate duty before manufacturers is to bring about as great a degree of co-operative action as circumstances will permit. It need not be expected that all will participate at first. It will take some time for the individual point of view to be superseded by the larger and broader vision; but much can be done if the will is there, and with the expert guidance which is available from the associations already mentioned there is no reason why it should not, and every reason why it should, be proceeded with immediately.—A.K.

The National Register

THE report of the Executive Committee of the National Register of Installation Contractors for the year ended December 31st last (which is to be presented at to-day's annual meeting) shows a surplus of income over expenditure of £449, as compared with £494 in the preceding year. Early in the year £500 War Loan was sold for current purposes, but was later replaced. A sum of £700 was placed on deposit at the bank, but £400 of this has had to be reclaimed for current purposes.

Applications for registration received during the year totalled 272 (against 262 in 1930), of which 106 were accepted, 92 were declined and withdrawn, and 74 remained under investigation. The net number on the Register at December 31st last was 1,490, as against 1,380 in 1930. Since the close of the year this number has been increased to 1,512. Registrations cancelled and names deleted from the Register since its inception numbered 796, 107 having been removed for failing to renew registration.

Inspection of Installation Work

Following a resolution passed at the extraordinary meeting of the Board in February last year, up to the date of the report three inspections of work by contractors on the Register arising out of complaints and two inspections of applicants' work have been made. Though it is intended to increase the number of inspections of applicants' work, the Executive Committee does not propose at present to make any recommendation to increase renewal fees, but suggests that it carries on its programme for another year when it will be in a better position to report on the inspections carried out and to make such recommendations as further experience may dictate.

Owing to the difficulty of fixing a suitable date, the joint conference between the Executive Committee and members of the Council of the Electrical Contractors' Association did not take place until January 22nd of the current year. Arising from this conference it is suggested that Rule 4 should be amended better to meet present conditions. Displayed advertisements in builders' and architects' journals were continued.

Investigation of Complaints

During the year under review ten complaints were received against registered contractors. As a result of investigation, one contractor was struck off the Register, one was removed at his own request, another was severely reprimanded, four were cautioned, and one complaint is still under investigation.

The formation of a local body called "A Branch of the National Register" has been brought to the attention of the Executive Committee, but while the Committee welcomes the formation of local circles amongst registered contractors, it states that no such local organisation has authority to assume this title.

It is believed that that there are twenty-three municipalities and authorities who restrict the work on their assisted wiring schemes to registered contractors, four of which are believed to have been added during the year under review.

Two firms were found to be wrongfully using the device of the National Register and gave an undertaking in the terms of an injunction sought and paid the cost of the proceedings. Another contractor gave the undertaking without the necessity of proceedings.

In order to deal more effectively with applications for registration from parts of Surrey and Hampshire, two additional Local Advisory Committees have been set up at Aldershot and Guildford.

The Executive Committee expresses appreciation of the work of the Local Advisory and Scrutinising Committees and again places on record its thanks to Mr. P. V. Hunter, the chairman.

Control Room Lighting

A lighting scheme of unusual interest has recently been devised and installed in the new control room at the Canning Town generating station of the West Ham Corporation Electricity Department, under the direction of Mr. J. W. J. Townley, A.M.I.E.E., the engineer and manager.

The essential requirements to be observed in the lighting of control rooms are the provision of adequate and well diffused illumination, with an entire absence of irritating reflections of the lighting system on the faces of instruments and meters, apart from the actual panel surfaces. As it was intended to employ control panels on both sides of the room, in addition to the ends, calculations were made on the basis of employing a continuous trough fitting 65 ft. in length suspended by steel channels attached to purlins fixed to the tie-rod roof structure.

The framework of this fitting is of mild steel, aluminium sprayed, glazed with crevasse glass, behind which are arranged Holophane "M.60" reflector units attached to special angled cleats alternated to the left and right. The illumination intensity on the face of the control panels is in the order of 10 to 12 ft.-candles. The lighting results are exceptionally effective and pleasing, and at all operating positions it is impossible to get any image of the actual source of light.

An illustration of the control room appears on page 637.

Costing in the Drawing Office. By A. C. Macneish

THE study of production costs has not made much progress in the drawing office. Costs in the drawing office are, in nearly all concerns, entered in the "general" or "on" costs. They are taken as an annual, or a semi-annual sum, and grouped with depreciation, rates and taxes, and other charges.

The drawing office is therefore regarded as a capital liability. That means that when estimating on a contract, after going into the minutest detail of the working of machinery, space occupied, time and wages of the worker, the price of material, and other details, we make a generalisation of the "on" costs. We make relative charges according to the price so far assumed on the contract, without going into detail to see if this job will mean two or twenty hours in the drawing office. We are then surprised when we fail to receive the contract, after having made such heavy cutting charges in the shops, or, if the order has been received, we are surprised that we have made a loss.

There are concerns which, having failed, have attributed their failure to lack of efficient costing control over the offices, where heavy carrying charges were made and yet never reasoned out. Some contracts which they had received, and finished at a loss, were found to contain much more than an average proportion of drawing office charges; others which they didn't get would have caused very little work in the office, but it was usual to make relative charges on the "on" costs.

Drawing office charges are relatively high, in comparison with all charges, when the contract is of a new type, when much calculation, design, or research is made before the final drawing can be produced.

Before we can estimate the cost of a contract we must analyse all factors of costing; otherwise we may have a quick series of repetition orders, of the things that we are producing at a loss. Costing for any office, whether it be clerical, drawing, or managerial, is not more difficult than for the producing shops.

Some concerns, where production is large and varied, have separated their drawing offices. In shipyards, the d.o. departments are hull, engine, and electric; in electrical manufacturing plants they are power (large, a.c. and d.c.), power (small), alternators, switchboard, wireless, &c. Draughtsmen are specialists, yet if we have a contract for a few men it is weighted with the carrying charge of the room. A contract worth, say, £10,000, may involve £1,000 in the d.o.; another worth the same amount may require only £50. Such variations in charges are not unknown. Efficiency in costing is more vital to the ultimate safety of the company than efficiency in the shops.

For brief and easy reference on the "Draughtsman's Day Card" I suggest that the department, instead of being known under a title, should be given a letter, or a double letter, if the number of departments warrants this, and the draughtsman a number, for easy indexing, and to meet any complications in names. Each contract specification would have its "section," and our own works would have a "group" number —not only for costing, but for construction and reference. The time of arrival, or non-arrival at the office, would show relative time lost and where extra charges were made. The rate per hour would be nominal, and based on salary-hours. The items, "rate per hour" and "total per day" would be supplied and filled in by the clerical department, which would also compute the total costs for the costing and estimating departments.

The "Costing Card" would be filled in by the clerical department from the series of d.o. cards, with a separate card for each drawing, or sketch, issued. Everything done on the drawing would be noted, irrespective of detail, and each item marked. If a repeat order came along, the drawings would be reissued, with no separate d.o. charges; but if a slight change were necessary, that could easily be computed on estimating, and the charges would only be drawing and checking. For other contracts the charges would be relative.

This would give us a lead in detailed estimating. The contract, when subdivided into the different parts, would also be subdivided into the different drawings. The number of drawings and sketches would be computed, and, on a new type of manufacture, it would be necessary to be liberal, to cover unforeseen extras. In work of a nature already produced, reference could be made to the previous group and costing cards.

The many extras, such as printing, salaries of charge men, and hours lost (if on salary) would have to be calculated in detail, as these charges may have had a great bearing on the preceding ones. These charges could be noted on either the cost card as an extra, or on a separate card, for the whole contract, stating time spent, or drawings issued against each.

A.C. GEN. WIRING DIAGRAM.

JOHN SMITH & CO., LTD.					COSTING CARD.
Title: *Wiring Diagram for 235 h.p. A.C. Syn.-Wound Generator.*					
Contract No.: *339.*		Group No.: *46.*			Section No.: *15.*
Drawing No.: *456.*		Sk. No.: —			£ s. d.
COST. Drawing:	*16* Hrs.	*2/1* per Hour			*1 13 4*
Tracing:	4 „	*9d.* „ „			*0 3 0*
Checking:	*1½* „	*2/2* „ „			*0 3 3*
Calculations, etc.:	*3* „	*2/1* „ „			*0 6 3*
Total Cost of Drawing					*2 5 10*

Costing card for estimating reference

Date: *12/7/31.*	JOHN SMITH & CO., LTD.			D.O. CARD.
	Name: *James Thomson.*		Dept.: *A.G.*	No.: *27.*
In: *8.50 a.m.* Out: *5.03 p.m.*	Contract No.: *339.*	Group No.: *46.*		Section No.: *15.*
	Drwg. No.: *456.*	Sk. No.: —.		Title: *A.C. Gen. Wiring Diagram.*
	Tracing: — Hrs.	Drawing: *6* Hrs.	Calculations: — Hrs.	Changes, etc.: — Hrs.
	Contract No.: *339.*	Group No.: *48.*		Section No.: *19.*
	Drwg. No.: —.	Sk. No.: *27/339.*		Title: *A.C. Gen. Special Bolts.*
	Tracing: — Hrs.	Drawing: *2* Hrs.	Calculations: — Hrs.	Changes, etc.: — Hrs.
	Total Hours Worked: *8.*	Rate per Hour: *25d.*		Total per Day: *16/8.*

Draughtsman's day card

Indian Electrical Imports

THE *Board of Trade Journal* contains a survey of the import trade of India during the first nine months of the fiscal year, April-December, 1931, by H.M. Senior Trade Commissioner in India. This shows that the total trade in electrical instruments, apparatus, appliances and parts (including telegraph and telephone apparatus, not being machinery), which in 1930 amounted to Rs.220 lakhs, was reduced to Rs.178 lakhs during the period under review. Imports from the United Kingdom fell from Rs.125 to Rs.89 lakhs, those from the United States from Rs.31 to Rs.27¼ lakhs, and those from Germany from Rs.28 to Rs.26 lakhs. Imports of electric fans and parts thereof fell from Rs.17½ to Rs.11¾ lakhs, the United Kingdom's share being reduced from Rs.11½ to Rs.7¼ lakhs. In electric wires and cables (rubber insulated), the total imports fell from Rs.28 to Rs.21 lakhs, those from the United Kingdom decreasing from Rs.21½ to Rs.13¾ lakhs. In electric wires and cables (insulations other than rubber), the United Kingdom supplied Rs.13 lakhs of a total of Rs.16 lakhs. Of bare copper wire (electrolytic) other than telegraph and telephone wires total imports were reduced from Rs.16¾ lakhs to Rs.15 lakhs—the United Kingdom's share falling in greater proportion from Rs.11¼ to Rs.7¼ lakhs.

The principal imports of electric lamps are classified under "gas-filled electric bulbs" and "vacuum electric bulbs." Of the former, the total trade amounted to Rs.12¼ lakhs, of which Rs.5¼ lakhs worth came from the United Kingdom; of the latter, the total trade amounted to nearly Rs.13 lakhs, the principal suppliers being the United Kingdom, Rs.4¼ lakhs, and the Netherlands, Rs.4¼ lakhs.

Under the heading of accumulators, imports were reduced from Rs.12½ to Rs.7¼ lakhs, of which the United Kingdom contributed Rs.5 lakhs, while under the heading of "electrical goods and apparatus not enumerated," total imports were reduced from Rs.38¼ lakhs to Rs.32 lakhs, the British share falling from Rs.21½ to Rs.16¾ lakhs, and that of the United States from Rs.8¼ to Rs.7¾ lakhs.

Parliamentary Notes

(BY OUR SPECIAL REPORTER)

ON April 20th Captain Peter Macdonald asked the Secretary of State for Dominion Affairs whether it was intended to place on the agenda of the Ottawa Conference the question of making use of the Empire broadcasting facilities, which would exist after the completion of the station at Chelmsford, in order to assist in imperial trade co-operation; and, if so, whether any arrangements would be made for an expert in such matters to accompany the British delegation.

Mr. Thomas said that it was recommended at the Imperial Conference of 1930 that the broadcasting organisations in the various parts of the Commonwealth should be encouraged to confer and to arrange for the reciprocal broadcasting of suitable programmes. In conformity with this policy a representative of the British Broadcasting Corporation had recently paid a visit to Canada where he was understood to have discussed the possibilities of co-operation and of an exchange of programmes. In all the circumstances the Government did not think it necessary to propose that the subject of Empire broadcasting should be placed on the agenda of the Conference, nor did it contemplate the inclusion of an expert in the United Kingdom delegation. None the less it would, of course, take any opportunity which might present itself of supporting any practical suggestions which would tend to facilitate further co-operation on the lines advocated at the last Imperial Conference.

A North Country Order

On April 20th Mr. Hunter asked the Minister of Transport if he could indicate when the North Lincolnshire and Howdenshire Electricity Special Order would be brought forward for the approval of Parliament, in view of the need for electricity supplies in this area.

Mr. Pybus said that this Order had been presented to both Houses of Parliament and had been referred to the Special Orders Committee of the House of Lords.

Legal

AT Retford last week the Corporation of the town was summoned on two charges of breaches of the regulations under the Factory Act. The matter arose out of the death of an employé while working upon a transformer in December last.

It was stated for the prosecution that the transformer kiosk in which the fatality occurred was divided by a partition which, however, did not reach the roof, there being a gap of thirteen inches at the top. On the other side of the screen, near enough to be touched, were conductors charged at 6,600 V. Mr. Bloore, the Corporation electrical engineer, had switched off the current from the transformer on which the deceased man was working but the conductors on the other side of the partition remained "alive." Apparently the man, working in a very confined space, had touched these conductors and was killed.

The prosecution submitted (1) that reasonable precautions had not been taken and (2) that a portable screen should have been provided.

For the Corporation it was urged that as far as was reasonable all practicable means had been adopted to prevent danger. Mr. G. H. Lake, city electrical engineer of Nottingham, said that the use of a portable screen in the kiosk was not practicable.

The Bench dismissed the summons relating to the non-provision of a screen but in respect of the other summons imposed a fine of £5 with 25 guineas costs.

Mullard Motion Dismissed

In the Chancery Division last week Mr. Justice Bennett had before him a motion by the Mullard Radio Valve Co., Ltd., for an interim injunction restraining C.P. Wireless, Ltd., from infringement of patent by selling radio valves below prices fixed by the plaintiff company's limited licence.

Mr. Watmough, for the plaintiff company, said the defendants had been selling two kinds of valves below the prices fixed by the licence for sale to the public. He read affidavits in support of the motion.

His Lordship asked if this were not a matter of contract between the manufacturer and seller. Mr. Watmough said the motion was not based on contract, but on infringement of patent.

His Lordship said the plaintiffs had to prove first that they made their valves in accordance with a certain patent specification, and that to those valves they attached conditions limiting the price for sale to the public. Then they had to prove that the defendant company had sold valves for which plaintiffs had a monopoly in breach of the conditions.

Mr. Watmough agreed and submitted that his affidavits did so sufficiently for the purposes of the motion. The cartons containing the valves bore the conditions of the limited licence. The plaintiff company manufactured valves under patents, the valves in question were manufactured under the patents and the defendant company sold them under the terms of the limited licence, which stated the price below which they were not to be sold; the defendant company had admitted that it had committed an infringement.

His Lordship gave judgment, without calling on Mr. Phillips for the defendant company to address him. He said that there was no proof at all in the evidence filed for the plaintiff company that the valves in question infringed any one of the letters patent referred to in the notice of motion. It having been conceded by the plaintiffs that there was no contractural relationship between them and the defendant company, and that they could not succeed on the motion unless they established that the valves in question were valves made in accordance with the specifications of one or other of the patents, he held that there was no proof of it in the evidence and the motion must be dismissed.

A Contract Dispute

In the King's Bench Division on April 22nd mention was made before Mr. Justice Finlay of the action by Lloyd-Wood Presswork, Ltd., sheet metal workers, of Birmingham, against Aron Electricity Meter, Ltd., which was before his Lordship on April 15th (see our last issue, p. 619).

The action was one for damages for breach of contract on the part of the defendants to take a certain number of brass front mouldings and terminal covers and sets of plugs manufactured by the plaintiff company.

His Lordship held that the contract was to supply goods as asked for under the contract and that the plaintiffs were right and were entitled to succeed. He adjourned the matter for the parties to arrive at a settlement if possible.

Counsel, on April 22nd, announced that the parties had acted upon his Lordship's suggestion and had arrived at a settlement, the defendants agreeing to pay plaintiffs £157 16s. for the goods.

Judgment was entered for plaintiffs for that amount.

A New Link Disconnecting Box

A NEW range of straight-through, and three- and four-way link disconnecting boxes for three-, four-, or five-core cables up to 660 volts has been placed on the market by W. T. Henley's Telegraph Works Co., Ltd. These boxes are similar in general construction to the existing range made by the company, but the design of the disconnecting link has enabled the overall size of the box to be considerably reduced.

The link consists of two heavy brass sections held together by a stainless steel spring, with a wedge clamping device at each end, which is operated by a screwdriver held vertically, and it may be inserted or removed by inserting an insulated handle in a tapped hole in its centre. The spring in conjunction with the form of the link prevents damage to the contact surfaces by arcing and provides a wiping action when the link is being withdrawn.

Other features are: a new method of connecting the cable cores to the terminal pillar, the use of a rigid "Bakelite" separator held together by corner pieces secured by metal eyelets, cable grip glands of the compound pocket type with mechanical bond, wrought copper conductor fittings and busbars, a diving bell cover with tongue and groove joint, and the absence of dry contacts under compound.

Detail and general views of the new Henley disconnecting box

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Wages in the Cable-making Industry

The Joint Industrial Council for the Cable-Making Industry announces that a fall in the cost of living to 44 per cent. above the 1914 level will involve a reduction in wages in the industry on the third pay day in May. The decreases in the weekly wages are as follows:—Male time workers: District No. 1, 1s. 11¼d.; District No. 2, 2s. Youths and boys (18-21): District No. 1, 1s. 5¼d.; District No. 2, 1s. 6d. Youths and boys (14-17): 5¼d. or 6d. Women (18 or over): 1s.; and girls, 6d.

The Sub-Contractors' Federation

At a recent meeting of the Council of the recently formed National Federation of Specialists and Sub-Contractors, a number of trade associations were admitted to membership, among them being the Electrical Contractors' Association, Inc., and the National Association of Heating, Ventilating and Domestic Engineering Employers.

A.E.I. Activities in 1931

With the annual report for the past year, the directors of Associated Electrical Industries, Ltd., have issued an illustrated brochure reviewing the activities of the group of companies during 1931. Some of the most notable achievements were the manufacture by the B.T.-H. Co. and the Metropolitan-Vickers Electrical Co. of two 67,000-kW turbo-alternators for the Battersea power station of the London Power Co., which are now practically finished, the completion of a new power station in Montevideo by the Metropolitan-Vickers Co., an order for two 21,250-kVA waterwheel alternators received by the B.T.-H. Co. for the Grampian Co.'s Tummel power station, orders placed for switchgear by the Central Electricity Board with the B.T.-H. Co., Metropolitan-Vickers Co., and Ferguson, Pailin, Ltd., and the supply of equipment for many important lighting installations by the Edison Swan Electric Co., Ltd., which has added to its range of domestic appliances a new all-British vacuum cleaner.

Demonstrations at Fulham

The Fulham Borough Council Housing Committee is to arrange for two of the tenements in the Fulham Court Housing Estate to be temporarily reserved for the purpose of demonstrating the use of electrical and gas fittings to the prospective tenants. The tenements will be equipped by the Electricity Department and the Gas Light and Coke Co., thus affording a comparison between electrical and gas methods.

The Situation in Ethiopia

In a report published by the Department of Overseas Trade on economic conditions in Ethiopia (Stationery Office, 1s.), Lt.-Col. G. Mackereth, H.M. Consul at Addis Ababa, states that in 1929 the country shared in the prosperity arising from the continued expansion of world trade. In 1930 the persistent depreciation of the foreign exchange value of the local silver currency stimulated export sales. On the other hand, imports, from the same cause, markedly diminished. Foreign competition has remained keen but on the whole British traders and manufacturers appear to have managed successfully in holding their own in most lines of profitable business. British merchants deal with about 36 per cent. of the total import trade and a rather larger proportion of the exports. Of imported goods to a value of £370,990 handled by these merchants, Great Britain was responsible in 1930 for £78,306 worth and British India £77,075; Japan was the largest supplier with manufactures valued at £135,406.

An "Efesca" Window Display at Putney

Our illustration shows a special window display of "Efesca" electric cookers at the County of London Electric Supply Co.'s

An "Efesca" display at the County Co.'s Putney showrooms

premises in Upper Richmond Road, Putney. Demonstrations of electric cooking and other appliances are given daily in the showrooms in the mornings and afternoons.

American Electrical Exports

A slightly brighter aspect was presented by the American electrical export market during February, the value of exports increasing by $597,013 as compared with the preceding month. The total of $4,706,901 was, however, $2,491,518 lower than the figure for February, 1931, although a few sections of the market showed an improvement. Large shipments to Russia resulted in an increase from $52,904 to $402,126 in the exports of power transformers of over 500 kVA, substantial advances also taking place in the shipments of radio transmitting apparatus ($63,162, against $46,425 in February, 1931), radio receiving valves ($160,606, against $135,872), starting, lighting and ignition equipment ($55,121, against $38,545), and steam turbine generator sets ($49,572, against $162). With few exceptions other items showed continued declines,

The New Import Duties

LAST week there was published as a White Paper (Cmd. 4066, Stationery Office, 6d. net) the Recommendations of the Import Duties Advisory Committee and the Additional Duties No. 1 Order, 1932.

The report commences with a statement that the Committee does not at present recommend any additions to the "free list" under the Import Duties Act, 1932.

The existing duties are reviewed, *e.g.*, the McKenna, safeguarding and key industry duties (the last including radio valves and magnetos).

It is pointed out that investigation into the condition of each industry with regard to its need for protection would take much time and cause harmful delay. The Committee therefore based its conclusions upon information already gathered by the Board of Trade, supplemented by certain inquiries of a general character. On this basis it has drawn up recommendations to cover in a general manner as large a part of the field as possible and its further efforts will be devoted to the investigation of the needs of individual industries.

The Committee proposes that the duties imposed under the three Abnormal Importation Orders shall cease, and that certain special classes of machinery not at present obtainable in this country shall be admitted free of additional duty, or all duty, as it shall recommend.

With regard to the amount of protective duty, the Committee considers a general rate of 33⅓ per cent. too high; it therefore proposes that the general level of additional duty (that is, additional to the present duty of 10 per cent.) shall as a rule be 10 per cent. Higher rates (15 or 20 per cent.) are recommended for articles of a luxury or semi-luxury character. There are, however, certain exceptions, the outstanding case being iron and steel upon certain classes of which an additional duty of 23⅓ per cent. is proposed.

The Order giving effect to these recommendations was made on April 19th to take effect upon April 26th. The first schedule to this sets out the duties in a number of classes of goods additional to the 10 per cent. *ad valorem* duty. This includes the following classes: the figures given in parentheses are the total rate (including the general 10 per cent. duty):—

Machinery and parts thereof (other than agricultural) excluding ball and roller bearings and belting (20 per cent.).

Illuminating glassware, viz., globes and shades (not including glass bulbs for electric filament lamps) (20 per cent.).

Electrical goods, including electric wires and cables, insulated; telegraph, telephone and wireless apparatus; electric carbons; electric lighting appliances and fittings, other than glass bulbs for electric filament lamps; batteries and accumulators; electric bell apparatus; electric cooking and heating apparatus; electric meters; parts of and accessories to the above (20 per cent.).

The second schedule covers iron and steel (including spiegeleisen and ferro-manganese) and imposes an additional duty of 23⅓ per cent. (making a total of 33⅓ per cent.) on a number of semi-finished products. These additional duties are to cease to be chargeable on the expiration of three months from the date of the Order.

Where, as in the case of magnetos, there is already a duty the new Order does not apply.

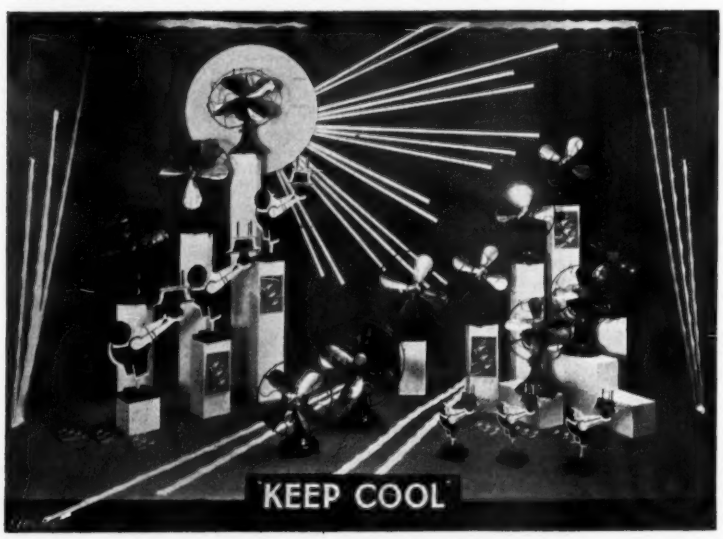
Simultaneously with the publication of the above Order, an Order was issued cancelling the three Abnormal Importations Duties imposed last year.

those most seriously affected being: D.c. generators, $3,904 ($36,250); self-contained lighting units, $7,530 ($39,065); batteries, $298,796 ($442,528); distribution transformers, 500 kVA and under, $13,126 ($86,930); double current and motor generators, dynamotors, synchronous and other convertors, $27,693 ($83,305); switchboard panels, not telephone, $27,286 ($340,601); power switches and circuit breakers over 10 A, $46,579 ($95,257); electric motors, $161,887 ($417,330); motor starting and controlling equipment, $50,237 ($108,298); portable electric tools, $26,758 ($82,661); heating and cooking apparatus, $66,473 ($151,378); and telephone apparatus, $62,907 ($240,628).

Canada continued to be the principal customer, taking $915,999 worth of goods, Great Britain and Soviet Russia occupying the second and third places with $453,572 and $423,607 respectively. Imports of electrical apparatus into the United States during February totalled $147,682, an increase of $41,710, as compared with February, 1931.

German Electrical Imports and Exports

The official returns just to hand show that the imports of electrical machinery and apparatus into Germany during January and February attained a value of £212,850 as compared with £359,200 in the corresponding two months of 1931. The exports of similar material from Germany during the period amounted to £3,150,350, the latter figure comparing with £4,315,600 in the corresponding period of last year. The import total was made up of £36,550 of electrical machinery, and parts and apparatus £181,300. The respective figures for the exports were £729,200 and £2,421,150.



An E.D.A. electric fan display

Australian Electrical Imports

The value of imports into Australia during the seven months ended January 1st last amounted to £24,859,000, as compared with £43,633,000 during the corresponding period of the previous financial year. Among the principal items which show large decreases are electrical machinery and appliances, the imports of which declined in value from £2,340,251 to £672,891.

Conditions in Sumatra

A Department of Overseas Trade survey of the economic situation of the east coast of Sumatra indicates that while exports fell from 193,591,000 guilders in 1930 to 164,983,000 guilders in 1931, imports declined from 104,915,000 to 62,872,000 guilders. The continuous development which took place between 1905 and 1930, giving an impetus to imports and maintaining prices in the import trade, has at the moment come to a standstill, and the rapid decline in imports has had a freezing influence on all sections of the commission business rendering largely worthless the credits previously extended and resulting in many bankruptcies. There is little reason to expect an immediate recovery and it is even questionable in recent circumstances whether imports can be maintained at the present level.

New Australian Company

A new company, the Standard Telephones and Cables (Australasia), Ltd., has been registered in Australia with a capital of £100,000 in £5 shares. The head office is at 71, York Street, Sydney, New South Wales, and the agent in Victoria is given as Mr. C. R. Foster, 588, Bourke Street, Melbourne. The directors are: Messrs. R. B. Hungerford, J. Clarke, R. S. Beckwith, G. W. Sturges, and E. H. McInnes.

Aluminium Competition

The rules of the International Aluminium Competition, 1932, are now obtainable from the British Aluminium Co., Ltd., Adelaide House, King William Street, E.C.4. Entries will be received up to October 1st.

Demand for Refrigerators in Canada

A Canadian correspondent reports that the demand for household electrical appliances is one of the most encouraging features of the electrical industry in Canada, refrigerators being especially in requisition. Manufacturers of electrical refrigerators, in co-operation with distributors of electrical power, are conducting an aggressive advertising campaign, and increasing their output to meet the anticipated demand.

Extension of "Diamond H" Factory

The Hart Manufacturing Co. announces that, as a result of considerably increased business, its new factory now being built at Chiswick is being extended in size and three further bays are now being added. The company hopes to take over the complete new building towards the end of June.

Proposed Austro-Brazilian Trade Agreement

According to a report from Vienna, the Austrian Ministry of Commerce has under consideration a proposal for an interchange of goods with Brazil. The suggestion is that Austria should take over a considerable quantity of coffee and that in return Austrian electrical firms should carry out extensive electrical work in Brazil. The value of the work is estimated at 100 million schillings.

The E.D.A. May Programme

The two window displays illustrated in the May programme of the British Electrical Development Association deal with refrigeration and electric fans. The former is so arranged that the electrical dealer who is unable to install an actual refrigerator can make use of a plywood facsimile cut-out. The features of the fan display, which we illustrate, are a "sun-ray" effect and the slogan "Keep Cool," the idea being to present a simple psychological attraction. The programme announces the issue of the second 16-sheet poster which relates to electric water heating; sample copies of this can be obtained free from the Association. The same design can also be obtained in 30 in. by 20 in. size. The local advertisements are designed to support the window displays and draw attention to electric refrigerators and fans. A price list of E.D.A. publications is included, and the director has contributed some notes dealing with the cooking campaign, details of which are given on p. 638 of this issue.

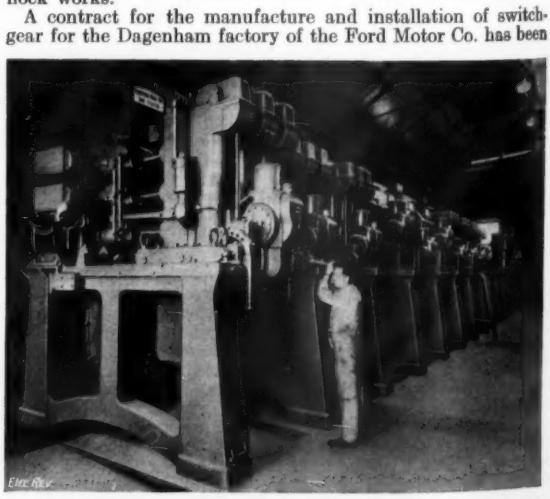
Recent Contracts

The Alton Battery Co., Ltd., has received an order to install at the Mayfair automatic telephone exchange, London, what the company claims to be the largest telephone battery in the world. It consists of 100 cells with an initial capacity of 9,900 Ah and an ultimate capacity of 13,000 Ah.

Messrs. Head, Wrightson & Co., Ltd., Thornaby-on-Tees, have received a contract for electrically operated vehicular ramps and passenger lifts for installation at the ferry piers at Hong Kong.

A sluice gate weighing 300 tons required to remedy defects in the Arapuni Hydro-electric Scheme was dispatched last week by Messrs. Glenfield and Kennedy, Ltd., from their Kilmarnock works.

A contract for the manufacture and installation of switchgear for the Dagenham factory of the Ford Motor Co. has been awarded to the Metropolitan-Vickers Electrical Co., Ltd. The order comprises nineteen metal-clad circuit-breaker units of the company's "K.5A-type" having ratings of 2,000 A and 1,200 A at 11,000 V with a rupturing capacity of 750,000 kVA. Three of these units will be used for sectionalising and interconnecting



Circuit breakers of the type to be used at the Ford works, Dagenham

duplicate bus-bars and the rest for feeder and generator control. The illustration shows a bank of similar "K.5A" units installed in the Ashburton Road sub-station at Stretford. Provision is to be made for the installation of a further set of probably still larger capacity at a later date. In order to minimise the risk of fire spreading from one section of the board to another it is proposed to divide the switchroom that houses the metal-clad gear into three main compartments by means of fireproof walls. In addition to these nineteen metal-clad units and duplicate bus-bars the contract includes an indicator and control board of the miniature type with illuminated mimic diagram. A separate relay board is provided which accommodates all the relays necessary for a very complete system of protection.

A large order involving a variety of different types of h.p. and l.p. switchgear for Barking power station has also been received by the Metropolitan-Vickers Company. This equipment will be used chiefly to control numerous boiler house and engine room auxiliaries. It includes a 3,000-V board made up of 25 "K-type" units, of which twenty-three will be operated by remote control and the remaining two manually. The h.p. section of the order also comprises equipment of the panel, sheet steel cubicle and pillar type. The l.p. switchgear includes 400-V cubicles and draw-out, pillar type control panels for the operation of various pumps and other auxiliaries; metal-clad "K-type" equipment for the control of the conveying and ash-handling plant; and eight contactor type switchboards for automatic starting of motors driving auxiliaries. Some d.c. control gear is also being supplied together with telegraph and similar apparatus.

It is reported that the British Mannesmann Tube Co. has secured an order for 26,000 steel poles for the telegraph and telephone service of the Iraq Petroleum Co., Ltd., in connection with that company's trans-desert scheme. This order is in addition to a share of the contract for pipeline.

Contractors at Lister's Works

On April 21st about fifty members of the Western Section of the Electrical Contractors' Association paid a visit to the Dursley works of Messrs. R. A. Lister & Co., Ltd. The party included Mr. F. Madge, chairman and hon. secretary, and Mr. E. Nicholas, secretary of the Cardiff branch. Our illustration shows the visitors inspecting some of the small engines which are incorporated in the company's "Lister-Light" sets.

South Wales contractors at Lister's works

Dundee and Foreign Cable

Dundee Corporation Electricity Committee at its last meeting agreed by eight votes to two to purchase foreign cable at a price of £3,933, the lowest British tender being £4,649. In the case of the foreign tender, it was pointed out, there was no extra charge for drums, which were not returnable, while the cables would be delivered duty and carriage paid. The firm in question gave the undertaking that the jute required in the manufacture would be purchased in Dundee. In favour of the British offer it was contended that home manufacturers were doing their best to compete with the foreigners, and that the low tender from abroad was an attempt to oust the British manufacturer independently of the tariff.

For Sale

Messrs. J. R. Parkinson, Son and Hamer offer for sale by tender the stock, fixtures, plant, &c., of the Bury Lighting and Heating Co., Ltd. (in compulsory liquidation).

(See our advertisement pages to-day.)

The Manufacturers' Agents' Association

At the meeting of the Council of the Manufacturers' Agents' Association of Great Britain and Ireland held last week it was stated that during the first three months of this year 218 inquiries had been received and dealt with and 1,574 agents' names submitted. These inquiries embraced all trades, but in consequence of the Abnormal Importations Duties and the general tariff there had been a slight falling off of the number of inquiries from Continental manufacturers. It is hoped that facilities will shortly be available for the formation of a new branch of the Association at Manchester.

Joint Showrooms at Doncaster

Attractive electricity showrooms are to be opened on May 2nd in High Street, Doncaster, by the Doncaster Corporation Electricity Department and the Electrical Distribution of Yorkshire, Ltd., jointly. Frequent cooking and other demonstrations will be given and the supply of cooking equipment on hire is to be strongly stressed.

Trade Announcements

Messrs. Davy Bros., Ltd., Park Iron Works, Sheffield, announce that under an agreement recently entered into they have become the sole manufacturing agents and representatives for Great Britain of the Watson-Stillman Co., of New Jersey, and possess sales rights for most of Europe. Consequently they are now in a position to supply any item of the Watson-Stillman range of products, which includes hydraulic plastic moulding and other presses, pumps, accumulators, valves, packing and pit jacks. The Watson-Stillman Co. recently purchased the business of the Burroughs Co. of U.S.A. and thereby added a further range of products to its list of plastic moulding equipment.

The British Electric Transformer Co. has appointed Mr. N. Tegetmeier, 20, Windsor Place, Cardiff, to represent it in South Wales as district manager for its transformers. Mr. Tegetmeier has for some time acted in a similar capacity for the company's "Tricity" and "Kye" lamp departments, and he will now act as representative for the whole of the company's products.

Messrs. J. Ernest Turner and Mr. Norman Turner have formed a private limited company (Ernest Turner, Electrical Instruments, Ltd.), to take over Mr. Turner's business at Chiltern Works, 55-73, Totteridge Avenue, High Wycombe. The new company will attend to liabilities and collect accounts due.

As some confusion has already arisen we are asked by the Alpha Electrical Apparatus Co., of Premier Works, Percy Road, Greet, Birmingham, to state that they are not connected with the company of a somewhat similar name which appeared in the action of Holophane, Ltd., *v.* Alpha Manufacturing & Electrical Co., Ltd., reported in the ELECTRICAL REVIEW of April 1st, p. 492.

C. W. Burkill & Co., radio and electrical equipment dealers, Castleford and Normanton, have opened additional premises at 93, Carlton Street, Castleford.

Lancashire Dynamo & Crypto, Ltd., has removed its London office to new and more commodious premises at York Mansions, 94, Petty France, S.W.1. The change will be completed by May 15th.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., have opened a new stores depôt at 37, Magdalen Road, Exeter, under the managership of Mr. W. A. Dobson. The telephone number is Exeter 4753, and the telegraphic address "Henletel Exeter."

The Canadian Radio Industry

Although more radio receiving sets were sold in Canada last year than in 1930, lower prices resulted in a 16 per cent. decline in the amount received by manufacturers. Sales in 1931 totalled 286,122 sets, valued at $18,141,000, as compared with 223,228 sets valued at $22,776,000 in 1930.—*Reuter's Trade Service* (Ottawa).

Italian Foreign Electrical Trade

The appended table shows the Italian imports and exports of electrical machinery and apparatus during last year as compared with 1930. The total values have been converted to sterling at an exchange rate of 92.9 per cent. lire to the £. It will be seen that the imports show a decrease of £1,075,445, or over 29 per cent., whereas the exports increased by £216,505 or nearly 23 per cent.

	Imports.		Exports.	
	1930. lire. (thous.)	1931. lire. (thous.)	1930. lire. (thous.)	1931. lire. (thous.)
Accumulators and parts	5,537	5,240	2,492	2,735
Lamp bulbs	3,415	1,619	—	—
Electric measuring instruments	4,979	3,855	469	394
Radio apparatus	88,706	56,298	3,594	6,351
Telegraph and teleph. apparatus	57,759	58,001	1,316	1,722
Misc. electrical apparatus	64,565	48,003	15,449	24,175
Electric furnace and other carbons	13,095	9,214	268	345
Insulated cable	3,109	2,069	9,442	13,276
Insulated wire	2,785	3,323	7,985	9,330
Electricity meters	6,833	4,223	592	823
Generators "without collectors"	24,244	13,217	2,481	2,382
Generators "with collectors"	30,851	16,984	29,977	20,329
Glass and porcelain insulators	1,321	597	1,549	3,034
Arc lamps	40	41	—	—
Incandescent lamps	24,061	11,028	8,040	4,525
Static transformers	8,078	4,820	1,707	15,983
Insulating tubes	102	79	148	218
Total lire (thousands)	338,520	238,611	85,509	105,622
Sterling values (at 92.9 lire to the £)	£3,643,915	£2,568,470	£920,440	£1,136,945

Edinburgh as a Manufacturing Centre

Before deciding upon sites for new factories manufacturers should obtain a copy of an illustrated booklet just published by the Edinburgh Development Committee. Edinburgh is excellently served with regard to communications, and the harbour of Leith, with its excellent range of docks and up-to-date equipment, passes much commerce to and from the Baltic and Continental ports, as well as with America, Canada, India, etc. The charge for electricity for industrial purposes

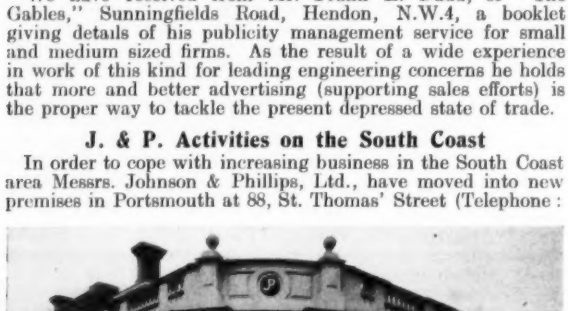
is about ¾d. per kWh for large users and already there are a large number of industries established in the neighbourhood. Information regarding available factory sites may be obtained from the burgh assessor, City Chambers, Edinburgh, and also from the London representative of the Development Committee, 23, Abingdon Street, Westminster, S.W.1.

Technical Publicity

We have received from Mr. Frank E. Dadd, of "The Gables," Sunningfields Road, Hendon, N.W.4, a booklet giving details of his publicity management service for small and medium sized firms. As the result of a wide experience in work of this kind for leading engineering concerns he holds that more and better advertising (supporting sales efforts) is the proper way to tackle the present depressed state of trade.

J. & P. Activities on the South Coast

In order to cope with increasing business in the South Coast area Messrs. Johnson & Phillips, Ltd., have moved into new premises in Portsmouth at 88, St. Thomas' Street (Telephone: Portsmouth 4354), a photograph of which we reproduce. Large stocks are carried at this address of wires and cables, J. & P. wiring system material, etc.



New J. & P. premises at Portsmouth

Agricultural and General Engineers, Ltd.

In the Chancery Division on April 25th, Mr. Justice Maugham made an order for the compulsory winding-up of this company.

New Catalogues and Lists

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—Leaflet No. 342/7-1, giving details of the company's type SL. moving iron ammeters and voltmeters. Also leaflet No. 76/6-1, dealing with combined controller equipments for mining service.

Reliance Telephone Co., Ltd., 12-13, Henrietta Street, W.C.2.—An illustrated folder on "Reliance" automatic intercommunicating telephones.

Belgrave Electric Co., 24, Belgrave Road, S.W.1.—Leaflets relating to electrical fittings and general accessories.

Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.—Bulletin No. 606 giving a number of graphs and data relating to "Permalloy."

Northern Steel & Hardware Co., Ltd., 1 and 3, Southgate, Deansgate, Manchester.—A leaflet giving particulars of the new "Northern" vacuum cleaner.

Revo Electric Co., Ltd., Britannia Works, Tividale, Tipton, Staffs.—An illustrated catalogue of "Revo" switch- and fusegear.

Veritys, Ltd., Plume Works, Aston, Birmingham.—Publication No. 1104 illustrating the new "Maxlume Overlamp" reflector.

Berkeley & Young, Ltd., Tyseley, Birmingham.—A folder (No. D/931) illustrating and describing Davidson electric fires, irons, and other domestic appliances.

British Aluminium Co., Ltd., Adelaide House, King William Street, E.C.4.—A 52-page booklet (No. 328) of aluminium foundry data.

Everett, Edgcumbe & Co., Ltd., 117, Victoria Street, S.W.1.—Leaflets describing the "Synclock" system of electric clocks. Illustrated and priced.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—Leaflet No. X.6163, giving technical details of the G.E.C. system of emergency lighting control for use in theatres, cinemas, &c.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—An illustrated leaflet describing the Henley sealing tab for preventing unauthorised interference with electrical apparatus.

Best & Lloyd, Ltd., Handsworth, Birmingham.—An illustrated catalogue of modern lighting fittings.

Lacy-Hulbert & Co., Ltd., 91, Victoria Street, S.W.1.—An illustrated pamphlet giving particulars of the "Boreas" tyre pump.

British Insulated Cables, Ltd., Prescot, Lancs.—A leaflet (P.F.93), describing the B.I. unit for feeder and distribution pillars. Illustrated.

L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, Kingsway, W.C.2.—A book of introduction cards for the use of dealers sending customers to Messrs. Hawkins's showrooms. Also leaflets relating to "Pye" radio receivers, lighting fittings and glassware.

Bankruptcy Proceedings

Hilton Garrett & Co. (other than J. B. Garrett), dealers in electrical supplies, 128, Queen's Road, Brighton, Sussex.—The debtor in this case, C. H. Garrett, a partner in the firm, attended at the Court House, Brighton, recently for his public examination. A joint statement of affairs was submitted which disclosed ranking liabilities of £1,159, with assets estimated to produce £371, and a deficiency of £789. The separate estate of C. H. Garrett showed ranking liabilities of £36 and assets of £4. The examination was adjourned for closing.

H. Busfield, 6, Wilfield Street, Burnley, Lancs, electrical engineer.—The public examination was held recently at the County Court House, Bankhouse Street, Burnley, when a statement of affairs was submitted which disclosed a deficiency of £131. The examination was adjourned.

T. H. C. Hughes, electrical and wireless engineer, 1,090, Manchester Road, Bradford.—Receiving order made April 16th on debtor's own petition. First meeting, April 29th, at the Official Receiver's office, Hallfield Chambers, 71, Manningham Lane, Bradford. Public examination May 20th at the County Court, Manor Road, Bradford.

C. Tempest, electrician, 4, Mann's Court, Bradford.—Trustee, Mr. R. Lindley, 21-22, Prudential Buildings, Ivegate, Bradford, released March 24th.

S. E. Hunt, electrical engineer and contractor, 8a, Torwood Street, Torquay.—Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C., released January 8th.

C. Bassham, electrical engineer, trading as Ashton & Holt, 16, Cross Street, Ryde, Isle of Wight.—The public examination was held recently at the Town Hall, Newport, when a statement of affairs was submitted which showed liabilities of £967, with net assets of £177, leaving a deficiency of £790. The debtor attributed his failure to insufficient capital, and said that he had been pressed by creditors for the last twelve months. The hearing was concluded.

F. W. Layton and **R. E. Mills** (East Anglian Wireless Co.), Hamilton Road, Felixstowe.—Receiving order made April 20th on debtor's own petition.

A. K. E. Strathdee (Emsco Radio), electrical engineer, 923, Romford Road, Manor Park, E.—Trustee, Mr. F. Vyvyan, Bankruptcy Buildings, Carey Street, W.C., released April 11th.

E. Brown (World's Wireless Stores), 10 and 12, Grosvenor Parade, Wallington.—Last day for receiving proofs for dividend May 11th. Trustees, Mr. L. W. Moscrop, 60, Strand, W.C., and F. W. Davis, 282, Theobald's Road, W.C.

Company Liquidations

Richd. Wade, Sons & Co., Ltd.—Meeting, May 27th, at Collingwood House, Church Square, West Hartlepool, to receive an account of the winding-up by the liquidator, Mr. C. C. Akers.

Grosvenor Battery Co., Ltd.—Meeting May 24th at 46-47, London Wall, E.C., to receive an account of the winding-up by the liquidator, Mr. F. H. Cooper Christmas.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, Etc.	Price April 27th.	Fortnight's Inc. or Dec.
a	Acid, Oxalic .. .. per lb.	5½d.	—
a	Ammoniac, Sal .. .. .. per ton	£60	—
a	Ammonia, Muriate (large crystal) .. „	£52	—
a	Borax .. .. „	£17	—
a	Copper Sulphate .. .. .. „	£25 10s.	—
a	Potash, Chlorate .. .. .. per lb.	3½d. to 4½d.	—
a	„ Perchlorate .. .. .. „	5½d.	—
a	Shellac T.N. .. .. .. per cwt.	£3 15s.	—
a	Sulphur Commercial .. .. .. „	£11	—
a	„ Roll .. .. .. „	£11	—
a	Soda, Chlorate.. .. .. .. per lb.	3½d. to 3¾d.	—
a	„ Crystals.. .. .. .. per ton	£5 to £5 5s.	—
a	Sodium Bichromate, casks .. .. per lb.	4d.	—
	METALS, Etc.		
b	Aluminium, Ingots .. .. .. per ton	£95 to £100	—
b	„ Wire .. .. .. per lb.	1/1 to 1/9	—
b	„ Sheet and Foil .. .. „	1/1½ to 2/9	—
p	Babbits Metal and Anti-friction Metals—		
	Grade I .. .. .. per ton net	£113	£11 inc.
	Grade II .. .. „	£83	£7 inc.
	Grade III .. .. „	£51	£3 inc.
c	Brass (rolled metal 2" to 12" basis).. per lb.	7d.	—
c	„ Tubes (solid drawn) .. .. „	9d. to 9½d.	—
c	„ Wire, basis .. .. .. „	7½d.	½d. dec.
c	Copper Tubes (solid drawn) .. .. „	9½d.	—
g	„ Bars (best selected) .. .. per ton	£63	—
g	„ Sheet .. .. „	£63	—
g	„ Rod .. .. „	£63	—
g	„ (Electrolytic) Bars .. .. „	£38	—
d	„ „ Sheets.. .. .. „	£68	—
d	„ „ Wire Rods .. .. „	£42	—
d	„ „ H.C. Wire .. per lb.	6½d.	—
f	Ebonite Rod .. .. „	1/3 to 1/6	—
f	„ Sheet .. .. „	1/3 to 1/6	—
m	German Silver Wire .. .. .. „	2/2	—
h	Gutta-percha, fine .. .. .. „	nom.	—
h	India-rubber, Para fine .. .. „	3½d.	—
i	Iron, Pig (Cleveland No. 3) .. .. per ton	58/6	—
i	„ Wire, galve. No. 1, P.O. qual. „	£20	—
g	Lead, English pig .. .. .. „	£13 15s.	15s. inc.
g	Mercury .. .. per bot.	£17 10s. to £18	—
e	Mica (in original cases) small .. per lb.	6d. to 3/6	—
e	„ „ medium .. „	4/- to 8/-	—
e	„ „ large .. „	8/6 to 17/6 & up	—
p	Phosphor Bronze, plain castings .. „	1/1½d.	—
p	„ „ drawn bars & rods „	11d.	—
p	„ „ rolled strip & sheet „	10½d.	½d. dec.
p	„ „ wire .. .. „	11½d.	7s. 6d. inc
o	Platinum .. .. per oz.	£10 11s.	—
d	Silicium Bronze Wire.. .. .. per lb.	7½d.	—
r	Steel, magnet, in bars .. .. „	7½d.	—
g	Tin, Block (English) .. .. per ton	£118 to £120	£13 10s. inc
n	„ Wire, Nos. 1 to 16 .. .. per lb.	3/1	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Boiling & Lowe.
l Richard Johnson & Nephew, Ltd
m P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Electricity Supply

Lighting, Domestic, Power

Basford (Notts).—ELECTRICITY FOR COUNCIL HOUSES.—The Rural District Council has decided to have electricity installed at Council houses at Colwick, where desired by the tenants, on payment of 7d. per week extra rent for three years.

Berwick-upon-Tweed.—OBJECTION TO SPECIAL ORDER.—The Town Council has decided to lodge an objection to the Scottish Border Electricity Supply Order, 1932, with a view to safeguarding its position with regard to the option it holds on the taking over of the electricity undertaking in the town.

Canada.—THE BEAUHARNOIS CASE.—The report of the Special Committee of the Senate which has been investigating the position of the three Liberal senators involved in the Beauharnois case was tabled last Friday. *The Times* states that after giving a history of the Beauharnois Corporation and its activities the report summarises the evidence about the part played by the three senators, and finds that the condemnatory conclusions of the Committee of the House of Commons which investigated the affair a year ago were justified, and that the actions of Senators W. L. McDougald and Haydon were not fitting or consistent with their duties as senators. With regard to Senator Raymond, it finds that he accepted very large sums of money by way of campaign contributions from the Beauharnois Corporation, but accepts his denial that influence directed towards affecting the Government's policy was actively exerted by him. The report adds, however, a rider that senators of Canada should not place themselves in a position of receiving campaign contributions from, or being interested in, enterprises dependent upon specific favours or concessions from Government. The report also absolves Mr. Ferguson from all knowledge of Beauharnois campaign fund contributions and finds Senator Haydon's statement in this regard incorrect. The report is signed only by the four Conservative members of the Committee, the three Liberals declining to endorse it.

Croydon.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £3,000.

Dundee.—DEVELOPMENT SCHEMES.—In order to deal satisfactorily with developing loads the Electricity Department is to proceed with the erection of a new static sub-station at Tay Square and the change-over of the system of supply in the surrounding area to a.c. An e.h.p. feeder is also to be laid between Carolina Port and the Walton sub-station, the estimated capital cost of the sub-station, with the plant, feeders, and the necessary switchgear at Walton sub-station being £11,000. It is also proposed to lay an e.h.p. cable from Carolina Port to Craigie sub-station at a cost of £2,400.

Faversham.—MAINS EXTENSIONS.—The Town Council has decided to extend mains to supply electricity to The Mount.

PUBLIC LIGHTING.—The public lighting in London Road is to be converted from gas to electricity.

Fifeshire.—ELECTRIFICATION SCHEMES.—Electric lighting is to be introduced by the Fife Electric Power Co. into Largo, Lundin Links, and Kilconquhar.

Friern Barnet.—SUPPLY TO SOUTH WARD ESTATE.—The Housing Committee recommends that the North Metropolitan Electric Power Supply Co. shall be granted permission to install electricity in all houses on the South Ward Estate where desired by the tenants.

Grassmoor (Derby).—A SUPPLY FROM CHESTERFIELD.—At a meeting of the Hasland Parish Council on Tuesday it was reported that Chesterfield Town Council had decided to give a supply of electricity to Grassmoor at the following proposed charges: Lighting, 6d. per kWh; power, from 2½d. to 1½d., on a sliding scale; and heating and cooking, 1½d. There will be an assisted wiring scheme with an additional charge of 1½d. per kWh until 1,000 kWh has been consumed.

Guildford.—TWO-PART TARIFF.—The borough electrical engineer is to submit an alternative two-part tariff based on floor space.

CHANGE-OVER.—During the year it will be necessary to change over certain districts of the town from d.c. to a.c., principally in roads and streets in which the existing cables were laid twenty or more years ago. A detailed scheme is to be submitted to the Electricity Committee shortly.

LOANS.—The Electricity Committee is to apply for sanction to loans of £5,000 for meters and £6,000 for the assisted wiring scheme.

Huddersfield.—REDUCED CHARGES.—The Town Council has decided to introduce the following reduced charges for electricity. Domestic rateable value charge, 12½ per cent. Power for combined houses and shops, 1d. per kWh. Industrial power and heating, 1d. per kWh; guarantees (with the exception of the minimum charge of 10s.) to be abolished. Maximum demand rate: First 250 kWh per quarter, 4d.; above 250 kWh, 1d. Commercial heating and cooking: A reduction from first 200 kWh per kW per quarter at 1½d. to first 300 kWh per kW per half-year at 1d., energy in excess being charged at ½d. per kWh. Late shop window lighting: 1½d. A discount of 5 per cent. is to be allowed to three-phase consumers for prompt payment of accounts.

Great Yarmouth.—OUTSIDE DECORATIVE LIGHTING.—During the summer quarters a special charge is to be made for outside decorative lighting of £2 5s. per kW per quarter plus 1d. per kWh.

Huntingdonshire.—SCHOOL LIGHTING.—The Education Committee recommends that tenders be invited for the installation of electric lighting in the following schools: Brampton, Farcet, Fletton, Houghton and St. Neots.

India.—BAHADRABAD POWER STATION COMPLETED.—The formal opening last month by Sir Malcolm Hailey, the Governor of the United Provinces, of the power station at Bahadrabad, near Roorkhee, marks the completion of the first stage of the scheme for the development of hydro-electric power from falls on the Upper Ganges Canal. The scheme constitutes an attempt to provide cheap electric power not only to the residents of 66 towns and large villages within an area extending over some 10,000 square miles of agricultural country, but also to cultivators in the intervening rural tract. *The Times Trade and Engineering Supplement* says that on the canal, between Hardwar and Aligarh, there are 13 falls ranging from 6 ft. to 12 ft., and 10 of them, capable of yielding 50,000 h.p. on the minimum discharge, have been selected for development. The present project provides 13,000 h.p. of this total, with 2,500 h.p. of oil-engine reserve power, from the four falls at Bhola, Palra, Bahadrabad, and Sumera. The largest of these four stations is that at Bahadrabad, with three Boving and one Escher Wyss turbines driving four 1,000-h.p. Metropolitan-Vickers alternators. It was built and equipped within 15 months under difficult conditions, the prevalence of drought making it impossible to close the canal for long periods. The scheme can be expanded, as demand arises, to the full total power which the canal is capable of yielding, by harnessing the six remaining falls, the main transmission lines having been so designed that by future duplication of circuits the whole of the power that can be economically developed at the various falls can be eventually utilised. It is computed that at the present rate of expansion the first stage will be loaded up in four years, and that it will thereafter be necessary to electrify one of the remaining falls each year. It is expected that not less than 15,000 h.p. will then be absorbed in rural load.

COCHIN HYDRO-ELECTRIC SCHEME.—*Indian Engineering* states that the London representative of the Swedish Hydraulic Engineering Bureau has examined a proposal to electrify the State of Cochin by the use of the large waterfall, the Peringalkuthu, on the river Chalakudi, where it is estimated 20,000 h.p. is available. A report is now to be prepared through Messrs. Rendell, Palmer and Tritton, London, with whom the Bureau co-operates.

Irlam.—THE ELECTRICITY SCHEME.—In connection with Irlam's recently completed electricity scheme, which has cost £103,000, it was necessary to lay approximately 10 miles of 33,000-V cable, five miles of 6,600-V cable and 33 miles of distributor cable. Messrs. W. T. Glover & Co., Ltd., were responsible for the laying and direction of the supply lines, while the Metropolitan-Vickers Electrical Co., Ltd., executed the contract for switchgear and transformers. The scheme was a joint one of the Stretford and District Electricity Board and the Urban District Council.

Isle of Man.—THE ELECTRICITY SCHEME.—A deputation has been appointed by the House of Keys to confer with the Governor of the island, Sir Claude Hill, on the financial aspects of the electricity scheme.

London.—ST. MARYLEBONE.—The Electricity Committee is to install rising mains at East Street tenements at a cost of £949.

BATTERSEA.—In order to deal with the increasing load on the Shaftesbury Estate, it is proposed by the Electricity Committee to lay additional distributing mains in Eland, Elsley, Hanbury, and Sabine Roads, at an estimated cost of £2,632. It is also proposed to provide electricity services for 139 premises at a cost of £1,184.

ST. PANCRAS.—The Electricity and Public Lighting Committee proposes the extension of mains at a cost of £1,117. Sanction to the following loans has been received: Mains, £6,378; sub-station equipment, £3,408; building work at Stanhope Street sub-station, £650; transformers, £385; and switchgear plant, £3,278.

Newbury.—REDUCED POWER CHARGES.—The Corporation reports that the Urban Electric Supply Co., Ltd., has made a substantial reduction in power charges but will make no concession for lighting. Further inquiries are to be made on points relating to the two-part tariff.

Norwich.—SUPPLY TO EASTON.—The Electricity Department announces that an electricity supply will be available in Easton next year.

Skegness.—NEW SUPPLY INAUGURATED.—A supply of electricity from the Mid-Lincs Electric Supply Co. was inaugurated at Skegness last Saturday by Mr. J. Crawshaw, chairman of the Urban District Council. The company, which operates over an area of approximately 700 miles, is giving the supply by means of a 24-miles overhead line from Boston, and later proposes to extend its activities to cover a large portion of the district around Skegness.

Stanhope (Durham).—STREET LIGHTING SCHEME REJECTED.—At a meeting of the Parish Council on Saturday it was reported that the scheme for street lighting in Upper Weardale, which had been approved by the Durham County Council, had now been rejected by the Minister of Health in view of the expense

and the need for strict economy. The Parish Council decided to consider an alternative scheme.

Taunton.—NEW PLANT.—The Town Council has decided to apply for sanction to borrow £22,000 for new electricity plant. A Special Order is also to be sought for the compulsory acquisition of property in Silver Street for the purposes of erecting a larger transformer sub-station.

MODIFICATION OF LIGHTING CHARGE.—The charge for electricity for lighting purposes where consumption exceeds 5,000 kWh per quarter is to be 2¼d. per kWh.

Teesdale.—PROPOSED BOYCOTT OF SUPPLY.—The opposition to the erection of "pylons" in Teesdale for the distribution of electricity was carried a step further last week, when a meeting of the ratepayers of Cotherstone and district pledged itself to boycott the supply, both publicly and privately, until the supply company agreed to put the cables underground. Cotherstone is a very popular holiday centre in one of the most beautiful parts of the dale.

Traction

Glasgow.—SCHEME FOR ELECTRIFICATION OF SUBWAY.—An important scheme for the electrification of the Glasgow subway is to be considered by the Transport Committee. The management has prepared a scheme for the adoption of electric traction, costing between £70,000 and £80,000, and it is estimated that under such a system between £20,000 and £30,000 per annum could be saved. For many years the subway has been operated at a considerable loss.

Huddersfield.—SCENTED TRAMS.—According to the *Daily Dispatch*, experiments are being made on four new tramcars at Huddersfield with deodorisers which are said to be able to keep the trams fresh for at least a month. Scents can also be diffused, and a choice will be made from violets, roses, and pinewood for permanent adoption if the experiments are a success.

Llanelly.—TROLLEY BUSES.—The Llanelly Electric Supply Co., Ltd., intends to convert its tramway system to trolley-bus operation.

London.—CHEAP FARES FOR EVENING TRAVEL.—The Highways Committee of the London County Council proposes to issue experimentally for a period of six months sixpenny tickets available for unlimited travel daily from 6 p.m. to midnight on the Council's tramways, under the same conditions as those which apply to the shilling all-day tickets.

UNDERGROUND RAILWAY EXTENSIONS.—Considerable progress has been made with the £3,300,000 extension scheme of the Piccadilly line to Hounslow West and South Harrow. Most of the stations on the new line have been reconstructed and four tracks will be in use between Hammersmith and Northfields. The service to South Harrow will be maintained wholly by Piccadilly trains, a local service being run between Harrow and Uxbridge. Both the Hounslow and South Harrow extensions will be completed by August.

Traffic Signals.—NEW INSTALLATIONS.—The installation of automatic traffic signals is being considered at Paddington (£4,364), Deptford, Guildford, and Darlington.

Communications

Belfast.—RADIO INTERFERENCE.—The Corporation Electricity Committee is to take steps to minimise the electrical disturbance of radio receiving sets in houses in which electric light is used. The installation of condensers of the electrolytic type in the undertaking's sub-stations is recommended.

Canada.—EMPIRE BROADCASTING.—The special committee of the House of Commons which has been investigating the broadcasting service concluded the hearing of evidence on April 22nd. An "All-Red" Empire-wide service, operated by an Imperial Radio Commission, has been suggested as likely to meet with the approval of all delegates to the forthcoming Imperial Economic Conference at Ottawa, and to be of sufficient importance to be discussed at the Conference.

LICENCE FEE.—While the receiving licence fee has been increased from $1 to $2 per annum as from April 1st, listeners have been given until June 1st to obtain their new licences.

Czecho-Slovakia.—TELEPHONE COMMUNICATION.—Among the telephone extension work to be carried out during the present year by the Czecho-Slovakian Post and Telegraph authorities is a new cable between Olmutz, Presov, and Zlin, and a connection at Teschen to afford communication with the Polish towns of Warsaw and Cracow.

Great Britain.—RADIO EXCHANGES.—The Darlington Corporation has referred an application for permission to set up a broadcast relay service to a sub-committee for consideration.

Strood Rural Council has granted permission to the Radio Central Exchange, of Gravesend, to extend its relay service in the rural area.

The Walton (Surrey) District Council is considering the proposed establishment of such a service, as are also the Friern Barnet and Wood Green Urban District Councils.

Applications made by Broadcast Listeners' Services, Ltd., to establish wireless relay services have been refused by the Urban District Councils of Grays, Barnes, Worsborough, and Tilbury, Hertford Town Council, and Strood Rural District Council. The company's application to Stratford-on-Avon Town Council is awaiting the result of the Town Clerk's investigation into similar services installed in other towns.

Irish Free State.—RADIO FINANCE.—In submitting an estimate to Dail Eireann for £60,310 in respect of radio broadcasting, the Minister of Posts and Telegraphs stated that last year's accounts were expected to show a surplus. The total revenue of £59,229 included £14,750 from licences, and £43,129 from the import duty on apparatus. Last year's total expenditure was £51,336. In the coming year a deficit was expected. During 1931-32 the number of licences issued was 28,683, the number of valve receivers was 24,968, and there were 3,715 crystal sets. The increase in the total number of licences was 2,700.

Italy.—NEW TELEPHONE CABLE.—The Pirelli Co., of Milan, is at present engaged on the manufacture of a land and submarine telephone cable which is to be laid between Italy (Rome) and Sardinia (Terranova). The cable will be about 156 miles in length and in parts will be at a depth under the sea of approximately 4,900 ft.; in addition to permitting telephone conversation, the line will be also used for transmitting telegraph messages.

London.—MARINE WIRELESS CONFERENCE.—Fourteen companies connected with marine wireless communication in more than twenty countries, which are jointly responsible for the service on the majority of the wireless ship stations of the world, were represented at a series of meetings held in London

This "hobby horse" is used by the Marconi Company to test its mobile radio apparatus for military use. It reproduces mechanically the movements of a pack animal

last week to consider problems arising out of the International Radiotelegraph Conference which will be held in Madrid in the autumn of the present year. This Conference will consider proposals in respect of the existing Convention and Regulations, signed at Washington in 1927, which cover all aspects of the wireless work of the world. The present meetings, held under the auspices of the Comité International Radio Maritime, have been held for the purpose of discussing and solving the technical and commercial problems involved. The member companies are working in close co-operation with their respective governments.

LOUD-SPEAKER BYLAW.—The Camberwell Council has rescinded a recently made bylaw and passed a more precise one prohibiting the creation of nuisance by the operation of radio loud speakers and gramophones "in or in connection with any shop, business premises, or other place which adjoins any street or public place, and to which the public is admitted."

Spain.—NATIONAL BROADCASTING.—Spain is at last to have a national broadcasting organisation on the lines of the B.B.C., and tenders have been invited by the Government for the erecting of wireless stations at Barcelona, Bilbao, Corunna, and Valencia, in addition to a 120-kW station outside Madrid. Hitherto broadcasting has been conducted by private companies and has not been very successful. When the new Madrid station is completed with a wave-length of 1,395 metres, it will be possible for the South American republics to listen and the smaller provincial stations of Spain will be able to broadcast foreign as well as national programmes throughout the Peninsula. Free receiving sets are to be installed in 1,000 villages, thus enabling the scattered inhabitants to keep in touch with outside affairs. From the small tax on receiving sets the revenue has been inconsiderable. The tax will be increased, and payment insisted upon, when the new national organisation is in being.—*Reuter* (Madrid).

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—May 10th. Posts and Telegraphs Department. Switches. (A.X. 11333.)*
May 31st. Electrical testing apparatus. (A.X. 11332.)*

Belgium.—IXELLES.—May 2nd. Hotel Communale. 1,300 d.c. electricity meters. Particulars (Cahier des Charges) from Le Service de l'Electricité, 20, Rue d'Alsace-Lorraine, Ixelles.
LIEGE.—May 15th. Société Anonyme des Tramways Unifiés de Liége et Extensions. Trolley buses. (G.X. 11389.)*

Cheadle and Gatley.—May 10th. Electricity Department. 6,600-V truck type control cubicle and a medium pressure stationary type ironclad unit. (April 22nd.)

Dagenham.—Urban District Council. Cables, switchgear, overhead conductors, &c. (April 15th.)

Dumfries.—May 7th. County Council. 11,000-V truck type switchboard for Gretna sub-station. (April 22nd.)

Dundee.—Corporation. Electric lighting for Lawton Road housing scheme. Borough surveyor, 91, Commercial Street.

Glasgow.—May 11th. Education Department. Electrical work at Springfield Road Advanced Central School. Education Office, 129, Bath Street (deposit £1 1s.).

Halifax.—May 2nd. Town Council. Electricians' work at 18 houses, Holmfield, and 16 houses and 16 bungalows, Shibden. Mr. D. T. Lloyd Jones, borough engineer, Crossley Street (deposit £1 1s.).

Hastings.—May 11th. Electricity Department. Boiler fuel. (April 15th.)

Horsham.—May 9th. Electricity Department. Cables. (April 15th.)

India.—SIMLA.—May 9th. Indian Stores Department. Tumbler and ironclad switches. (A.X. 11337.)*

Lithuania.—KOVNO.—May 13th. Posts, Telegraphs and Telephones Administration. Telephone material. (A.X. 11336.)*

London.—CENTRAL ELECTRICITY BOARD.—May 2nd. 33-kV and other cables for the South-West England and South Wales Scheme. (April 8th.)
ISLINGTON.—May 4th. Electricity Department. Work in connection with the rental and hire-purchase installations. Borough electrical engineer, 60, Eden Grove, N.7.

Manchester.—May 7th. Rivers Committee. Electrical pumping plant for Davyhulme sewage works, Urmston. Secretary, Corporation Rivers Dept., Ship Canal House, King Street.

Middlesbrough.—May 12th. Electricity Department. Cables and meters. (April 22nd.)

Midlothian.—May 6th. County Council. Electrical works in connection with three housing schemes (104 houses). County architect, 9, Drumsheugh Gardens, Edinburgh.

New Zealand.—WELLINGTON.—June 7th. Post and Telegraph Department. Magneto bells. (A. 11331.)*
June 22nd. Insulators. (A.X. 11335.)*

Retford.—April 30th. Nottingham County Council. Electric lighting installation at the County Institution. County architect, Shire Hall, Nottingham (deposit £1 1s.).

Ripon.—City Council. Electricity scheme for Wath, Melmerby, and Skelton. City engineer, Town Hall.

The public address system van which Standard Telephones & Cables, Ltd., has supplied for Sir Alan Cobham's tour to popularise flying in this country

South Africa.—CAPETOWN.—June 22nd. Electricity Department. Voltage regulators. (A.X. 11328.)*
May 18th. Overhead line material and street lighting fittings. (G.X. 11372.)*
JOHANNESBURG.—May 26th. City Council. Transformers (A.X. 11329) and traction lamps (A.X. 11330.)*

Uruguay.—MONTEVIDEO.—July 11th. National Administration of the Port. Electrically operated goods lifts and cranes. (A.X. 11338.)*

West Hartlepool.—May 3rd. Electricity Department. Cables. (April 22nd.)

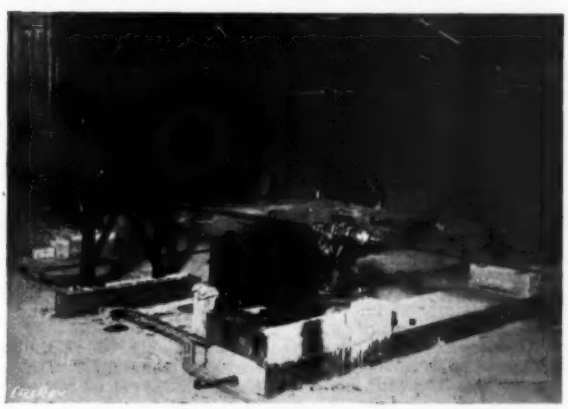
* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barnstaple.—Town Council. Accepted. Exhaust piping, water cooler, fuel storage tanks, &c. (£975).—Mirrlees, Bickerton and Day, Ltd.

Croydon.—Electricity Committee. Recommended. Irrigation stacks for cooling towers (£679).—Premier Cooler & Engineering Co. Air heaters for boilers (£7,124).—Underfeed Stoker Co.

Durham.—County Education Committee. Accepted. Installation of electric lighting in schools:—East Rainton new Council school (£169), and Crookhill Council school (£186).—F. Reid, Ferens & Co., Ltd.; Emmaville Council school (£183).—T. G. Usher & Co., Ltd.; West Stanley Alderman Wood secondary school (£292).—R. Robson.



Part of the stage machinery in the Shakespeare Memorial Theatre **(see page 624)**

Hazel Grove and Bramhall.—Urban District Council. Accepted. Meters.—Siemens Electric Lamps & Supplies, Ltd.

Hornsey.—Electricity Committee. Recommended. Cables for twelve months.—Pirelli-General Cable Works, Ltd. Troughs and bridges.—Doulton & Co., Ltd.

London.—L.C.C. Accepted. Provision of two electric lifts at Westminster Technical Institute (£743).—Express Lift Co., Ltd.
ST. PANCRAS.—The Contracts and Stores Committee recently received tenders for the supply of l.p., a.c. switchgear from Crompton Parkinson, Ltd.; Harland Engineering Co., Ltd.; New Switchgear Construction Co., Ltd.; Switchgear & Cowans, Ltd.; Johnson & Phillips, Ltd.; General Electric Co., Ltd.; English Electric Co., Ltd.; Ferguson Pailin, Ltd.; British Thomson-Houston Co., Ltd.; and A. Reyrolle & Co., Ltd.
Prior to these tenders being received, the chief electrical engineer had inspected switchboards advertised for sale for a total sum of £350. The Committee has therefore authorised the purchase of these and recommended the acceptance of an offer of the English Electric Co., Ltd., for the supply and erection of three cubicles at a cost of £450.
METROPOLITAN WATER BOARD.—Recommended. Two sets of electric pumps for Shoreham pumping station (£495).—Mather and Platt, Ltd. Electric pump for Kempton Park works (£75).—Harland Engineering Co., Ltd.

Mansfield.—Water Committee. Recommended. Electrically operated booster plant at Chesterfield Road pumping station (£403).—Mather & Platt, Ltd.

Sittingbourne and Milton.—Joint Hospital Board. Accepted. Stand-by electrical plant (£554).—Ruston Hornsby, Ltd.

Tynemouth.—Electricity Committee. Accepted. 100-kVA transformer (£184).—Metropolitan-Vickers Electrical Co., Ltd.

Forthcoming Events

Royal Institution.—Monday, May 2nd. Institution, London. 5 p.m. Annual general meeting. Friday, May 6th. 8.30 p.m. Conversazione.

Lighting Service Bureau.—May 2nd-5th. 15, Savoy Street, W.C. 25th Illumination Design Course.

Institution of Civil Engineers.—Tuesday, May 3rd. Institution, London. 6 p.m. James Forrest Lecture. "Some Aspects of the Corrosion Problem." Mr. U. R. Evans.

Institution of Electrical Engineers.—Thursday, May 5th. Institution, London. 6 p.m. Varley Centenary Commemoration meeting. "Cromwell Fleetwood Varley (April 6th, 1828) and Samuel Alfred Varley (March 22nd, 1832)." Lt.-Col. A. G. Lee. 6.45 p.m. Annual general meeting. (*Meter and Instrument Section*).—Friday, April 29th. Institution, London. 7 p.m. "Future Progress in Electrical Measuring Instruments." Dr. C. V. Drysdale. (*South Midland Students' Section*).—Saturday, April 30th. 2.15 p.m. Visit to Castle Bromwich R.A.F. Aerodrome.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the name and address of the makers of the following:—

NEALE magnet hand lamp.

Notes

New Switchgear at Portsmouth

New switchgear at the generating station at Gunwharf Road, Portsmouth, was formally put into operation by the Lady Mayoress of Portsmouth (Mrs. F. G. Foster) last week; the complete change-over to the new control room will be effected in the course of the next few weeks. The original generating station at Portsmouth was built in 1892, and when the three-phase 6.6-kV system was adopted after the war, the pre-war 2-kV plant was scrapped. The present plant consists of two 10,000-kW, two 5,000-kW, and one 2,500-kW turbo-alternators and six 30,000-lb. and two 50,000-lb. boilers; two boilers under construction have each a capacity of 88,000 lb. of steam per hour. The undertaking serves an area of 182 sq. miles, and its output last year was 43 million kWh, including six million in bulk to other authorised undertakers. The increased capacity of the plant, and the prospect of interconnection with the national grid made it necessary to replace the older switchgear by equipment suited to the heavier duty; this was manufactured and erected by the English Electric Company, Ltd., at an approximate cost of £43,000. The new switchgear is housed in a self-contained three-storey steel-frame building (costing £50,000), connected with the turbine room only through a door on each floor, accessible from an iron staircase.

The main switching apparatus is distributed on the two lower floors, the top floor containing only the control boards. The switching equipment consists of twenty-eight 6,600-V three-phase units of the compound-filled metal-clad double bus-bar type with a rupturing capacity of 500,000 kVA. Each switching unit weighs approximately 6½ tons, and its tank contains 100 gallons of oil.

At the subsequent tea in the Guildhall, Mr. B. Handley (engineer and manager) emphasised that the supply of electricity was becoming more and more a business matter, and that machinery was only a means of carrying out their business. He also referred to the Corporation's five showrooms and said that during the last twelve years they had increased their sales of electricity by 1,000 per cent.

Mr. G. H. Nelson (managing director, English Electric Co., Ltd.), presented the Lord Mayor, Alderman F. G. Foster, J.P., with a case of brushes, and Councillor W. J. Lewis, chairman of the Electricity Committee, with a silver cigarette box.

Capt. J. M. Donaldson, M.C. (president, I.E.E.), and Mr. J. W. Beauchamp (Central Electricity Board) congratulated Mr. Handley on the undertaking.

I.E.E. Golf Meeting

It is proposed to hold a golf meeting on June 30th, the day of the Institution Conversazione. The Committee has arranged with Moor Park Golf Club, Rickmansworth, for the privilege of using its club premises. There are three courses, and it is proposed to have a medal round of 36 holes, one round on the high course, and one round on the west course; also a bogey competition, one round to be played either in the morning or afternoon; the third course will be available if a sufficient number of entries is secured. The entrance fee for each competition will be 10s. 6d., which will include the green fee for the day. The competitions are in aid of the benevolent fund and are open only to members (of all classes) of the Institution who have a club handicap of not more than 24. Members interested should apply to the hon. secretary of the competition, Mr. Percy Rosling, at the Institution Offices, Savoy Place, Victoria Embankment, W.C.2, before May 14th.

An Electrically Propelled Bicycle

Trials which have been made in Holland with an electrically propelled bicycle invented by the Philips Company, of Eindhoven, are reported to have yielded satisfactory results. The company has granted the right of manufacture to five specified Dutch works, and the bicycle is expected to be placed on the market shortly. The bicycle is equipped with a "Varta" accumulator battery and an "Emi" motor, and will attain a maximum speed of about 13½ miles an hour, while the distance capable of being ridden without the battery being recharged is stated to be fifty miles.

The E.A.W.

At a meeting of the North-West Midlands Branch of the Electrical Association for Women on April 21st a lecture, illustrated by lantern slides, was given by Miss Simonsen, of the Telephone Development Association, entitled "Your Servant the Telephone."

The first county conference of the Association was held at Leeds on April 23rd, when 100 members of the branches at Leeds, Bradford, Halifax, Hull and Harrogate were present. The chair was occupied by Mrs. W. B. Woodhouse (president of the Leeds branch), who was supported by Miss C. Haslett, and officers of the Yorkshire branches. Among those present were Mr. W. B. Woodhouse and Mr. Wells (Y.E.P.), Mr. N. MacLean, Harrogate, Mr. H. Moss, Bradford, and Capt. A. W. Brown, area officer of E.D.A., who was the hon. conference secretary. After the chairman's opening remarks, the gathering was addressed by Miss Haslett on "The Organisation and Purpose of the E.A.W."

Lady Fisher-Smith (Halifax) proposed that a county organisation should be formed; this was seconded by Mrs. Brenard (Halifax), and carried unanimously. The new organisation will meet twice yearly.

Miss Haslett then dealt with the proposed organisation of a conference of Yorkshire teachers and others, for the purpose of promoting knowledge of domestic electrification. This matter was finally left over for future consideration, as it was deemed advisable to get in touch with the various educational authorities, and work in co-operation with them. Mrs. Woodhouse entertained the whole of the delegates to tea.

Mrs. Turner (Harrogate), proposed a resolution (which was carried) calling upon makers of electric cookers to arrange for the surface of the hob containing the hot plates to be perfectly flat and even, so that several utensils could be used simultaneously without being tilted; and also that in future designs the position of the oven should be considered with a view to having it situated in a more convenient position to avoid the necessity of stooping.

Mrs. Woodhouse then gave an address on "Electricity and Decoration," which was followed by a very useful discussion.

Appointments Vacant

Assistant mechanical electrical engineer for Bombay, Baroda and Central India Railway.

Borough electrical engineer for Durban (Natal).

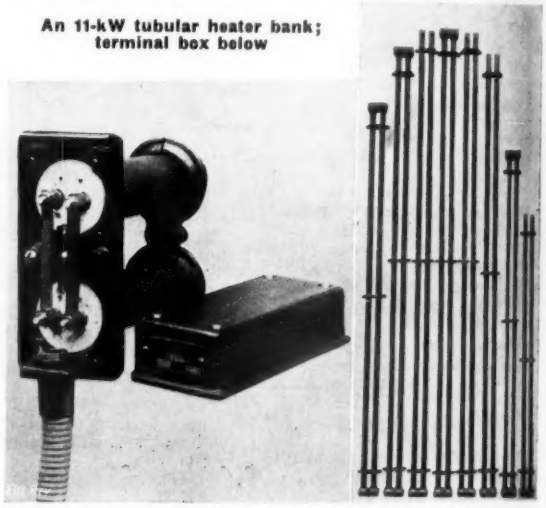
Test room assistant for Battersea Electricity Department.

Clerks for Fulham Electricity Department.

(See our advertisement pages to-day.)

Adaptable Tubular Heating

In our issue of April 1st, we published an article on "Tubular Heating." One of the accompanying illustrations sent us by Electroway Heaters, Ltd., shows tubular heaters recently



An 11-kW tubular heater bank; terminal box below

installed in a factory. The whole of these heaters (rated at 11 kW) were supplied from two points only, on opposite walls of the building. The heaters along each wall were connected together at the ends, some of the units being fitted with terminals for the purpose, resulting in an appreciable saving in installation and wiring costs. The other illustration shows a terminal box with cover removed; the terminals projecting are thus readily accessible for wiring.

Belfast Association of Engineers

The annual report of this Association for the year ended September 30th, 1931, shows that the membership rose to 343, and that the average attendance at meetings was 80, an increase of 33½ per cent. Nine meetings were held, at three of which electrical subjects were discussed, and a number of summer visits to places of engineering interest took place.

Sub-station Insulators

What a few years ago was called "ageing" of an insulator has been found generally to have no connection with the porcelain itself but to be due to insufficient care in making the joints, faulty design of metal parts, wrong distribution of mechanical load over the mass of porcelain, and sometimes to the porcelain being over-fired. Failures experienced before the evolution of the modern type of pedestal insulators were principally due to wrong distribution of the mechanical load between metal and porcelain to which the insulators were subjected and to insufficient consideration being given to the efforts created by the coefficients of expansion of metal, porcelain, and cement.

British manufacturers are confident that they have overcome the difficulty due to the expansion of cement joints, although Continental makers appear to be still troubled by it. The insulators shown in the illustration on page 652 of a high-voltage sub-station were manufactured for the British Porcelain Co., Ltd., who inform us that in competitive tests at the National Physical Laboratory an insulator of this type was the only one to pass all the specified tests.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

The address of **Mr. H. C. Siddeley** in Argentina is:—c/o British Embassy, Cable Reconquista, 314, Buenos Aires.

Lord Ashfield sailed from Southampton for New York on the Cunard *Berengaria* on April 23rd. He is expected to be away about a month and is visiting Canada to complete a report for the Royal Commission on Canadian Transport.

We regret that by a slip of the pen in the note relating to **Mr. G. Barnard** in our last issue, we stated that an antique silver tankard was presented to Mr. Groves instead of Mr. Barnard.

Mr. W. Grant, for many years manager of the Corporation tramways at Ayr, who has retired, has been presented by the Corporation members and officials with two easy chairs. Mr. Grant is taking up his residence at Blackpool.

At the Institution of Electrical Engineers on April 21st, the Faraday Medal was presented to **Sir Oliver Lodge, F.R.S.**

Sir Oliver Lodge receiving the Faraday Medal

The president (Captain J. M. Donaldson), in making the presentation, recalled that it was instituted in 1921 to commemorate the fiftieth anniversary of the Society of Telegraph Engineers, the first designation of the Institution of Electrical Engineers. The president contented himself with asking Sir Oliver to accept the Medal, feeling it superfluous to attempt to outline the work done by him which had led the Council to make the award on this occasion.

Sir Oliver Lodge referred to the meetings of the Society of Telegraph Engineers which he had attended and to the fact that he had received premiums on two occasions for papers he had presented to the Institution. The award of the Faraday Medal was the climax, for he supposed it was the last medal he was likely to receive. Speaking of some of the pioneers in electrical science he mentioned the efforts of Col. Crompton to popularise electric lighting, and he also recalled Graham Bell coming over here with the first telephone. He thanked the Institution for the honour conferred upon him and congratulated the members on the great enterprises which they individually and in their corporate capacity had undertaken.

The marriage took place on April 16th at Bowden of **Mr. Anthony Bertram Thomas,** only son of Mr. Bertram Thomas, head of the firm of Messrs. Bertram Thomas, electrical engineers, of Manchester, and Miss Audrey Prescott-Hill.

Mr. D. M. MacFarlane, who has been employed by Messrs. C. A. Parsons & Co., Ltd., Newcastle-upon-Tyne, since 1920, is leaving to take up a position with the Sirocco Engineering Co., Ltd., at Belfast. He was formerly with Sir W. G. Armstrong, Whitworth & Co., Ltd., Newcastle.

Mr. D. H. Bishop, electrical engineer and manager of the Dundee electricity undertaking, has been elected chairman of the Scottish Centre of the Institution of Electrical Engineers for the ensuing year.

We are informed that **Mr. W. L. Hambly** has relinquished his connection as sales representative for the Manor Electric Oven & Fire Company.

Mr. H. Donald Lloyd, who recently relinquished the position of assistant sales engineer for the South Coast with Messrs. Johnson & Phillips, Ltd., asks us to state that his home address is 87, Westminster Road, Birchfields, Birmingham.

Mr. W. E. Collins was presented with plate by members of the Lancashire and Yorkshire Section of the Electrical Wholesalers' Federation held in Leeds on April 21st. Mr. Collins, who is the proprietor of Albion Electric Stores, Leeds, acted last year as secretary of the Section, and during the previous year was its chairman.

Mr. E. H. Sharpe, managing director of Exide Batteries of Australia, Ltd., has arrived in England with his wife and daughter.

Mr. C. H. Cox and **Brig.-Gen. R. F. Legge** have been elected Companions of the Institution of Electrical Engineers.

Sir Holberry Mensforth, chairman of the English Electric Co., Ltd., and a vice-president of the British Electrical and Allied Manufacturers' Association, is visiting South Africa. This is his first visit to the sub-continent, and while it is mainly concerned with the important contract which the company has in hand for the electrical equipment of the Pretoria steelworks, he will make a tour of the Union, visiting the principal centres. Sir Holberry is accompanied by Lady Mensforth.

Mr. W. Brown, a member of the electrical engineering staff of the Dalbeattie Electric Light & Power Co., who was married on April 23rd, has been presented with a chiming clock by his colleagues.

Mr. F. Westlake Parkinson, M.I.E.E., notifies us that his address as from April 30th will be Bank of Ireland Chambers, Queen's Bridge, Belfast.

Mr. H. G. Baker has relinquished his appointment of buyer and manager to the Universal Electric Lamp Co. His private address is 56, Millman Street, W.C.1.

Capt. P. P. Eckersley is leaving England to-morrow (Saturday) with Mrs. Eckersley to investigate broadcasting in Australia.

Lord Meston has again accepted the presidency of the National Association of Trade Protective Societies. This is his third successive year as president.

Monsieur d'Arsonval has recently been elected honorary president of the Société Francaise des Electriciens. M. d'Arsonval is a pioneer of the electrical industry in France and was the joint inventor of the Deprez-d'Arsonval galvanometer.

The Marchese Marconi has been awarded the 1932 Kelvin Medal and will be presented with it by Lord Rutherford at the Institution of Civil Engineers on Tuesday next.

Mr. Harold Atherton, partner in the firm of W. H. Atherton and Son, electrical engineers, Heswall, was married at Stockton Heath Parish Church, Warrington, on April 14th, to Miss Jessie Sutton, of Stockton Heath.

Obituary

Mr. G. H. Browne.—The death is announced of Mr. G. H. Browne, of Huddersfield, who in 1902 was appointed assistant to the Wigan Corporation Electricity and Tramways Department, and as such took a prominent part in the design and layout of the tramway system. Subsequently he became power station engineer to the Swindon Corporation Electricity and Tramways Department, and later he held the appointments of deputy borough electrical engineer and tramways manager at Ilkeston, and manager of the Mexborough and Swinton Tramways Co. Since 1919 he had been chief engineer to a firm at Kirkheaton, Huddersfield.

Signor V. Granfranceschi.—The death is reported from Milan of Signor Vittorio Granfranceschi, a leading Italian authority upon hydro-electric installations.

Mr. W. Kerfoot.—We regret to announce the sudden death of Mr. W. Kerfoot, secretary of British Insulated Cables, Ltd., who was taken ill on April 24th at the West Lancashire Golf Club and died in the clubhouse. Mr. Kerfoot, who was in his sixtieth year, joined the staff of the company, then known as the British Insulated Wire Company, in 1896. He became assistant secretary in June, 1901, and in September of the same year was appointed secretary. He leaves a widow and two daughters.

The late Mr. W. Kerfoot.

Dr. A. Hay.—The death is reported on April 13th, of Dr. Alfred Hay, who was at one time professor of electrotechnology at the Royal Indian Engineering College, Cooper's Hill, and later at the Indian Institute of Science at Bangalore. Dr. Hay was 66 years of age.

Will.—Prof. E. Wilson, Emeritus Professor of Electrical Engineering at King's College, left £13,429 (net personalty £13,360).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Nova Electrical Co., Ltd.—Private company. Registered April 15th. Capital £100 in £1 shares. Objects: To carry on the business of manufacturers and merchants of wireless and electrical goods, &c. The subscribers are: E. Randall, 655, Green Lanes, Harringay, N.8, and C. H. Warbey, 9, Pembury Road, N.17. C. H. Warbey is the first director. Registered office: Charing Cross House, 29a, Charing Cross Road, W.C.2

Dangerfields, Ltd.—Private company. Registered April 15th. Capital £500 in £1 shares. Objects: To carry on the business of manufacturers and repairers of, agents for and dealers in, dynamos, electrical accumulators, batteries, &c. The directors are: J. I. Dangerfield, 25, New Street, West Bromwich, and four others. Registered office: 25, New Street, West Bromwich.

W. & G. Public Address, Ltd.—Private company. Registered April 22nd. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers, distributors and repairers of and dealers in public address equipment, loud speakers, amplifiers, talkie installations and equipment, &c. The permanent directors are: C. W. Willmott, 2, Britannia Road, Norwich, and A. W. Giles, Thorpe St. Andrew, Norwich. Secretary: D. R. Snelling, 43-51, Prince of Wales Road, Norwich.

J. G. Eaton & Co., Ltd.—Private company. Registered April 22nd. Capital, £12,000 in £1 shares. Objects: To acquire the business carried on at Hyde Road, West Gorton, Manchester, by J. G. Eaton, as the Economic Refrigerating Co., and to carry on the business of engineers, manufacturers and erectors of refrigerating and cold storage plant, ice factories, &c. The directors are: J. G. Eaton, The Priory, Cheadle Hulme, Cheshire, and J. Eaton, The Winnats, Strines Road, Marple, Cheshire. Solicitor: W. C. Rogerson, 5, John Dalton Street, Manchester.

Refrigerator Holdings, Ltd.—Public company. Registered April 22nd, with a nominal capital of £1,250 in one penny shares. Objects: To adopt an agreement with Haslam and Newton, Ltd., to manufacture, deal in and repair refrigerators,

Sub-station insulators in Canada. **(See p. 650)**

cold storage, and freezing plant, &c.; to acquire, hold or dispose of shares, debentures or other securities in any company which is empowered to carry on any such business. The subscribers are: E. H. Wiseman, 8, Severn Avenue, Gidea Park, Romford; G. W. Waspe, 325, Hertford Road, Waltham Cross, and five others. Solicitors: J. D. Langton & Passmore, 16, Tokenhouse Yard, E.C.

Joseph Boyce, Ltd.—Private company. Registered April 20th. Capital, £1,000 in £1 shares. Objects: To acquire the business of electrical and wireless engineers carried on by the Cleethorpes Radio Co., at 39, St. Peter's Avenue, Cleethorpes. The directors are: J. Boyce and Mrs. Hannah E. Boyce, both of 90, Bradford Avenue, Cleethorpes. Registered office: 39, St. Peter's Avenue, Cleethorpes, Lincs.

Electrical Machinery & Equipment Co., Ltd.—Private company. Registered April 19th. Capital, £200 in £1 shares (41 ordinary and 159 6 per cent. cumulative preference). Objects: To acquire the business of engineers, consultants and distributors of machinery and electrical apparatus, carried on by C. Seymour and A. H. Debenham, trading as Electrical and Machinery Equipment Company, at 131-132, Bunhill Row, E.C.1. The directors are: C. Seymour, 20, Palliser Court, W.14, and two others. Secretary: H. E. Davis. Registered office: 115, Moorgate, E.C.2.

Terrytone Radio Products Co., Ltd.—Private company. Registered April 23rd. Capital £100 in £1 shares. Objects: To carry on the business of electricians and wireless technicians, &c. The subscribers are: E. E. L. Lacock, 20, Upper Hornsey Rise, N.19, F. E. Gee, 133, Edgwarebury Lane, Edgware, Middlesex. Secretary: G. Smith, 2a, Trump Street, E.C.2.

Howard Radio, Ltd.—Private company. Registered April 23rd. Capital £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in gramophones and sound reproducing machines, electric accumulators and batteries, radio valves, &c. The subscribers are: C. H. Blazier, 11, Downhurst Avenue, Mill Hill, N.W.7, W. H. Young, 48, Bulwer Road, Leytonstone, E.11. Secretary: M. Marks, 5, Kenneth Crescent, Cricklewood, N.W.10.

Returns of Electrical Companies

Bartrum, Roylance & Co., Ltd.—Capital, £5,000 in £1 shares. Return dated January 19th, 1932. 2,500 shares taken up. £2,500 paid. Mortgages and charges: £1,181 5s. 4d.

Wholesale Supply Co. (Hull), Ltd.—Capital, £4,000 in 2,000 preference and 2,000 ordinary shares of £1 each. Return dated May 1st, 1931 (filed April 8th, 1932). 1,750 preference and 2,000 ordinary shares taken up. £3,750 paid. Mortgages and charges, nil.

Great Asby Electric Light & Water Co., Ltd.—Capital, £2,000 in £5 shares. Return dated January 11th, 1932. 282 shares taken up. £1,410 paid. Mortgages and charges, nil.

Suppliers Construction Co., Ltd.—Capital, £650,000 in £5 shares. Return dated December 2nd, 1931. 110,000 shares taken up. £350,000 paid, £200,000 considered as paid. Mortgages and charges, nil. A return of allotments made up to March 9th, 1932, shows a further 18,630 shares allotted as fully paid by way of bonus.

F. Jeffrey, Ltd.—Debenture dated March 25th, 1932, to secure £100, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: F. Jeffery, 14, Raven Court, Alexandra Road, Southend-on-Sea.

Electrical & General Industrial Trusts, Ltd.—Satisfaction (1) to the extent of £2,500 on April 4th, 1932, and (2) to the extent of £7,500 on April 7th, 1932, of debentures authorised July 10th, 1930, and registered July 14th, 1930. (According to the register of mortgages, the debentures registered July 14th, 1930, originally secured £25,000.)

Furneaux & Thomas, Ltd.—J. S. C. Taylor, 13, St. Mary Street, Swansea, was appointed receiver on April 11th, under powers contained in debenture dated November 5th, 1930.

Melbourne Electric Supply Co., Ltd.—Capital, £1,750,000 in 150,000 8 per cent. 1st preference shares of £5 and £1,000,000 consolidated ordinary stock. Return dated December 23rd, 1931. 100,000 preference shares and £800,600 ordinary stock taken up. £1,286,445 paid on preference shares and £786,445 ordinary stock. £14,155 considered as paid on £14,155 ordinary stock. Mortgages and charges: £1,793,586.

Barrett & Wright, Ltd.—Charge under Land Transfer Acts, 1875 and 1897, for £1,000, dated December 8th, 1924, on freehold premises at 200, Hornsey Road, Holloway. Holder: S. A. S. Yeo, St. Andrews Lodge, Homefield Road, Sudbury.

English Electric Co., Ltd.—Satisfaction to the extent of £12,100 on January 15th, 1932, of 5½ per cent. debentures secured by trust deed dated September 15th, 1919, and registered October 3rd, 1919.

Vee Cee Dry Cell Co. (1927), Ltd.—Capital, £6,000 in 4,000 preference and 2,000 ordinary shares of £1 each. Return dated December 2nd, 1931. 3,050 preference and 2,000 ordinary shares taken up. £4,670 paid (including £20 paid on forfeited shares). £400 considered as paid. Mortgages and charges, nil.

Stanley Cox, Ltd.—Capital, £2,200 in 1,500 8 per cent. cumulative preference and 700 ordinary shares of £1 each. Return dated December 31st, 1931. 1,000 preference and 700 ordinary shares taken up. £1,700 paid. Mortgages and charges, nil.

Electricity Services, Ltd.—Capital, £5,000 in £1 shares. Return dated November 11th, 1931. 4,025 shares taken up. £3,965 paid. £60 considered as paid. Mortgages and charges, nil.

Galliers (Wholesale), Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1931. 100 shares taken up. £50 paid. £50 calls unpaid. Mortgages and charges, nil.

Wye Lighting, Heating & Power Co., Ltd.—Satisfaction in full on March 31st of mortgage dated May 21st, 1928, and registered June 6th, 1928. (According to the register of mortgages, the only charge registered on June 6th, 1928, was a memorandum of deposit which originally secured all moneys due to the company's bankers.)

City Notes

Associated Electrical Industries, Ltd., in its report for 1931, which was submitted at yesterday's annual meeting, shows that after deducting all expenses, other than interest on debenture stock and depreciation, there was a profit of £284,829, as compared with £372,998 in 1930. To this is added £110,411 brought in, making £395,240 available. Debenture interest absorbs £41,454 and depreciation £74,937, but nothing is placed to reserve (against £25,000). The ordinary dividend is 4 per cent. (against 6 per cent.), and £99,899 is carried forward. The trading results include profits from the subsidiary companies to the extent to which dividends have been declared. These results have been arrived at after charging against profits all losses on exchange incurred during the year. Since the last annual meeting the £1,396,390 7 per cent. mortgage debenture stock of the British Thomson-Houston Co., Ltd. (one of the subsidiaries), has been redeemed; the finance required was provided by the issue of 1,399,560 A.E.I. ordinary shares of £1 each. These shares, which rank for a full year's dividend as from January 1st, 1932, were offered to the ordinary shareholders on the basis of two new shares for each complete five shares held, at a price of 21s. per share. The report states that owing to the industrial and financial depression the volume of orders in 1931 was less than in the previous year, but it is hoped that with more settled conditions a revival in trade may be anticipated. The resignation from the board of Major-General Sir Philip A. M. Nash is recorded. The accounts include a consolidated balance sheet of the group as at December, 1930. This incorporates the assets and liabilities of the A.E.I., Ltd., and of its subsidiary companies.

Johnson & Phillips, Ltd., reports a profit, after providing for bad debts and charging upwards of £12,000 for maintenance of buildings, plant, &c., of £96,455 for the year ended December 31st last, as compared with £128,334 for the preceding year. The net profit, after meeting debenture interest, depreciation, &c., is £35,494 (against £78,806), to which £102,223 is added, and after transferring £5,000 to research and development account a total of £132,717 is available. It is proposed to pay a dividend of 5 per cent. on the ordinary shares (against 10 per cent.), leaving £102,717 to be carried forward. The report states that trading conditions during 1931 were exceedingly difficult owing to the world-wide depression, and the reduced profit is the direct result thereof. Meeting: May 5th.

The Lanarkshire Traction Co. reports a revenue for the year ended December 31st last of £197,490, as compared with £142,464 in the preceding year, and a gross profit of £36,705, as against £9,981. A deficit of £350,954 is brought forward from the preceding year, and after providing for debenture interest, &c., a deficit of £353,677 is carried forward. The report states that the results for the year are regarded as satisfactory in view of the loss incurred in operating the final section of the tramway undertaking, the expense of changing over from tramway to motor buses, &c. In order to raise additional capital to meet heavy commitments, a further offer of debentures will be made shortly.

The Ever-Ready Co. (Great Britain) Ltd. has recommended a final dividend of 25 per cent., making 35 per cent. for the year (same). The accounts will be issued on May 9th, and show, subject to completion of audit, a net profit of £332,485 for 1931 as compared with £306,111 in the preceding year, the reserves and carry-forward being £694,120, as against £612,375. The directors have decided to make an issue of ordinary shares to ordinary shareholders registered on May 5th, in the proportion of one new share for every five shares held, at the price of 10s. per share.

The Cia. Hispano-Americana de Electricidad ("Chade"), reports a profit for 1931 of 85,075,826 gold pesetas against 119,910,354 pesetas in 1930. The net profit available for distribution is 36,518,885 pesetas, against 54,219,577. Amortisations amount to 37,010,560 pesetas (against 51,190,092 pesetas). It is proposed to pay a final dividend of 6 per cent. (gold), free of Spanish taxes, making a total dividend for the year of 12 per cent. (gold) net, against 17 per cent. for 1930. The sales of electricity showed a slight increase as compared with the preceding year.

The Western Union Telegraph Co. reports gross revenues, including dividends and interest of $22,538,943 for the quarter ended March 31st last, as compared with $28,352,011 in the corresponding quarter of 1931. The net income was $83,428 (against $1,504,897), which, with the surplus at the beginning of the quarter, makes $93,416,479. From this is deducted a dividend of 1 per cent. for the quarter (against 2 per cent.), leaving a surplus and undivided profits of $92,371,453 ($95,107,554).

The Anglo-American Telegraph Co., Ltd., reports that the quarterly dividends amounting to 3¾ per cent. on the ordinary stock, 6 per cent. on the preferred ordinary stock, and 1½ per cent. on the deferred ordinary stock, together with £64,312 for income tax, absorbed £262,500, being rent paid by the Western Union Telegraph Co. for the year. The balance at credit of revenue account (£65,625) is available for the payment of dividends for the quarter to March 31st last.

The British Power & Light Corporation (1929), Ltd., has recommended a dividend of 3 per cent. on the ordinary shares for the year ended March 31st last. This is the first distribution to be made by the company. Meeting: May 6th.

The North Wales Power Co., Ltd., proposes to pay an ordinary dividend of 4 per cent. for the year ended December 31st last. This company is controlled by the British Power & Corporation, and the dividend is the first since the consolidation was effected.

Imperial & International Communications, Ltd., reports that the estimated traffic receipts for the quarter ended March 31st last were £1,255,169, as compared with £1,251,037 in the corresponding period of 1931. It is pointed out in comparing aggregates regard must be had to the notes issued with the traffic figures from March, 1931, to February, 1932.

Pye Radio, Ltd., reports net profits of £122,676 for the year ended March 31st last, as compared with £70,225 in the preceding year, to which is added £20,193 brought in, making £142,869. It is proposed to pay a final dividend on the deferred ordinary shares of 117 per cent., making 125 per cent. for the year (against 100 per cent.), and to carry forward £66,103.

The British Columbia Power Corporation reports net earnings for the nine months ended March last of $3,563,500, as compared with $3,943,000 for the corresponding period of the preceding year. Preferred share payments absorbed $1,874,000, leaving $1,689,500 available for distribution on the common shares.—*Reuter* (Montreal).

The Bridgwater & District Electric Supply & Traction Co. reports a gross profit for 1931 of £5,862, as compared with £5,726 for 1930. After providing for depreciation, interest, &c., there is a balance of £666, which with £1,552 brought in makes £2,218. The ordinary dividend is 5 per cent. (against 7 per cent.), and £968 is carried forward.

The Rangoon Electric Tramway & Supply Co., Ltd., reports a net profit for 1931 of £77,012, as compared with £85,461 in the previous year. It is proposed to pay a final dividend of Rs.1.2a, making Rs.1.8a for the year, free of Indian tax, and to carry forward £28,842.

The Merthyr Electric Traction & Lighting Co., Ltd., reports a net profit of £24,563 for 1931 (against £27,820 in 1930). It is proposed to place £10,000 to reserve (same), to pay an ordinary dividend of 2½ per cent. (against 6 per cent.), and to carry forward £3,950.

Scottish Power Co.—It is reported that the company has placed privately 90,000 new ordinary £1 shares at 27s. 9d., free of stamp duty.

Lewes and District Electric Supply Co., Ltd., in its report for 1931, shows a net revenue of £13,785. A sum of £4,000 is placed to reserve, a dividend of 10 per cent. is paid, and the carry-forward is £2,365.

The Tynemouth and District Electric Traction Co., Ltd., in its report for 1931, shows a surplus of £6,979. After adding £1,065 brought in and setting aside £7,000 for renewals, it is proposed to carry forward £1,044.

The Weston-super-Mare and District Electric Supply Co., Ltd., shows a net revenue for 1931 of £44,247. General reserve receives £15,000, and the ordinary dividend is 10 per cent., leaving £7,305 to be carried forward.

Hopkinsons, Ltd., report a profit for the year ended January 31st last of £41,241 (against £41,512 in the previous year). The ordinary dividend is maintained at 5 per cent., and £18,479 is carried forward.

The Penarth Electric Lighting Co., Ltd., reports a net revenue for 1931 of £12,835. The ordinary dividend is 7½ per cent. and £3,270 is carried forward.

The Sheerness and District Electric Supply Co., Ltd., shows a net revenue for 1931 of £20,485. Reserve receives £6,000, a dividend of 10 per cent. is paid, and £4,489 is carried forward.

The Craigpark Electric Cable Co., Ltd., has announced a final dividend of 6 per cent. on the ordinary shares, making 10 per cent., less tax, for the year.

Stocks and Shares

Tuesday Evening.

THE outstanding factor in the world of finance, and the one upon which it is necessary to focus attention, is the ease of the money market, and the strong probability, amounting almost to a certainty, that gilt-edged stocks will move on to a general level of a 4 per cent. yield on the money. The mists of politics rise as a miasma upon most of the nations of the world, tending to obscure the one salient factor just mentioned. At the same time, the attention of foreign capitalists is forced to observe the security offered by British Government and industrial stocks. The constant outbreaks of disorder in the United States are having the effect of dislodging capital from America and bringing it back here, while the fall, last Thursday, in Bank Rate to 3 per cent. is now declared to be but a precursor to a 2½ per cent. rate and a long period of cheap money. This condition of affairs argues, of course, quietude in trade, and an increasing difficulty of finding profitable employment for money in the industrial world. Those companies which are doing well at the present time are regarded with such favour that, taking the electrical industry as an illustration, it is increasingly difficult to obtain offers of stock, such as 5 per cent. debentures, at anything like the par price. In fact, the demand is such that, at the present time, jobbers in the Stock Exchange markets admit candidly that they have no stock in the cases of a good many electrical securities, and that the likelihood of their being able to obtain any supply is sufficient reason for their refusal to sell, even at high prices now quoted. The dealers' books contain lists of brokers anxious to obtain offers of various favourite stocks on behalf of clients who want to purchase these. This applies more particularly to the debenture stocks of the lighting and power companies. As a rule, the issues of stock are comparatively small, and, unless a deceased account comes to market, the prospects of being able to obtain any stock with which to satisfy the demands of the buyers are slender.

"Tons of Money"

British Government stocks stand now on a level of yield which is rather less than 4¼ per cent., notwithstanding the disappointment felt at the Government's decision not to reduce income tax. The amount of money available for investment at the present time is surprisingly large, and most people are looking forward to some early intimation from the Government of an intention to convert the 5 per cent. War Loan into some other, and lower interest bearing, security that will be offered to proprietors of the 5 per cent. War Loan who may prefer to convert rather than to take cash for their stock.

Investment Stocks

It is natural enough, in these circumstances, that two of the stocks singled out for attention should be the 4¼ per cent. debentures of the Central Electricity Board and the London and Home Counties Authority. The yield on these stocks is a shade under 4¾ per cent., and as the stocks are not eligible for trustee investment, the inquiry or the buying comes from people who stand outside the circle of trustees. It is frequently contended that those two debenture stocks are of very much sounder character than a number of others which have the cachet of being trustee investments. Were the Government's hands less full of business, it seems likely that both these securities would be given inclusion in the trustee ranks, though, as the whole question of trustee investment is in great need of overhauling, it can hardly be supposed that the Government will tackle the question at a time when they have so much else to think about.

Central Board new scrip is strong at 7¾ premium. On the new London and Home Counties scrip, the premium is 12s. 6d.

Debenture Stocks Available

The Shropshire, Worcestershire and Staffordshire 5 per cent. debenture can be bought at 102¼, showing a gain of a

point on the week. The yield at this price is £4 17s. 9d. per cent. This return is 2s. per cent. more than that offered by London Power 5 per cent. redeemable debenture stock, of which £5,000 is on offer at 104¼. General Electric 5 per cent. mortgage debenture stock can be bought at 102½, to give £4 17s. 6d., and the cover protecting the interest service is remarkably ample. County of London 5 per cent. debenture stock stands at 106.

Home Electricity Shares

Few changes have taken place in the prices of the ordinary shares in the list of Home electricity supply companies. Chelseas are a little better at 26s. 6d. The feature is the way in which the preference shares have been absorbed. Edmundson's 7 per cent. preference have strengthened to 26s. The newly issued Electrical Distribution of Yorkshire 6 per cent. preference, over subscribed several times, have been in active request in the neighbourhood of 3s. premium above the issue price of a guinea at which the shares were offered. The preference shares of the good provincial companies pay less than 5 per cent. on the money, though on the "Three Counties" 6 per cent. preference at 23s. 3d. a return of £5 3s. 3d. per cent. can be obtained. Scottish Power 6 per cent. preference stand at 24s., and Midland Counties Electric 6 per cent. preference at 24s. 6d. There are a few London Electric Supply Corporation 6 per cent. preference shares of £5 each, and non-cumulative as to dividend, on offer at 6½ xd., returning £4 17s. 9d. per cent. Of the preference shares in the equipment companies, 2,000 General Electric 6½ per cent. "A" preference have been on offer at 26s., giving the round 5 per cent. on the money, and with dividends due at the end of June and December. Of 94,750 Scottish Power new ordinary shares, substantial lines have been changing hands at 27s. 9d. In the foreign group, Whitehall Electric 7½ per cent. preference have further fallen to 17s. 6d., making a decline of 4s. 6d. in a fortnight, holders being rendered nervous by the slump that has occurred in certain American utilities in which the Whitehall Electric Investments is said to be interested.

The American-Canadian prices are better, on account of a rise in the value of the dollar in relation to sterling. Brazilian Tractions have strengthened to 12, and Hydro-Electrics to 8⅜.

Home Railway Market

Upon relaxation of the recent pressure to sell Metropolitan Railway consolidated stock, the price sharply recovered 4 points, rising to 35½. As mentioned last week, the yield on "Mets." at the then price came to a little over 11 per cent., assuming maintenance of the 3½ per cent. dividend paid in 1931. The fall had been overdone, and possible reduction in the dividend was well discounted. Districts remain at 51½, at which the yield is 8¾ per cent. on the money, on the basis of last year's dividend of 4½ per cent., while the yield on Underground Electrics at 18s., on the 7 per cent. dividend of 1931, is 7¾ per cent. The Metropolitan District has placed a line of £300,000 5 per cent. debenture stock at 101½. The recently offered debenture stocks of the old Undergrounds stand at 6½ premium for the District issue and 3½ premium for the Metropolitan. No changes of any consequence have occurred in the London tramway group stocks. London and Suburban Traction Preference continue flat at 3s. 9d., business having been marked recently at 4s., a price that is regarded, in Stock Exchange parlance, as being option money. British Electric Traction deferred is 25 down at 725 and the preferred at 119½ has lost 2 points.

Telegraphs and Telephones

Heaviness in Marconi Marines continues to be one of the features in the group of cables and wireless stocks. The price has gone back to 24s. 6d., having fallen almost continuously since the dividend was reduced from 15 per cent. to 10 per cent. Cables & Wireless preference and ordinary stocks have shaded to 42½ and 13½ respectively. The latest traffic figures are still unsatisfactory. No recovery has occurred in Globe Telegraphs. American Telephone & Telegraph remain at 135, though Internationals at 8 are ½ better. American Telephones fell in Wall Street to below 100, the London price being due, of course, to the premium on gold. The price in New York left the list of American utility and railroad stocks without a representative that stood above 100. English financiers who have recently been in New York and Washington, to study the position at first hand, declare that the worst element in the situation is the refusal of the Americans to treat with seriousness the plight into which their national finances have fallen.

Manufacturing and Equipment

Manufacturing and equipment shares are, generally speaking, a little lower. An exception to this is provided by Ever-Ready shares, which have strengthened to 25s. on the dividend and bonus announced last week. General Electric ordinary are also a little harder at 36s. 3d. Associated Electrical Industries ordinary show no change at 18s. 3d. British Insulated, Callenders and Henleys have eased off. In the iron and steel list, Babcock & Wilcox receded to 43s. 9d., and Vickers have gone back to 6s. 10½d. The buying which took place on the idea that the heavy industries will benefit considerably by the imposition of further protective duties was backed up by no fresh support, and tired bulls sold their shares in disappointment at their hopes failing to materialise.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1930.	1931.	Price. April 26.	Rise or Fall.	Yield p.c.
HOME ELECTRICITY COMPANIES						
Bournemouth and Poole	1	15	15	60/9	—	£ s. d. 4 18 9
Brompton Ordinary	1	8½	8½	28/-	—	5 0 0
Central Electricity 4½% Deb.	Stock	4½	4½	95½	—	4 14 1
Charing Cross Ordinary	1	8½	8½	29/-	—	4 16 7
Chelsea	1	8½	8½	26/6	+6d.	5 5 8
City of London	1	10	10	37/6	—	5 6 8
Clyde Valley	1	8	7	28/3	−6d.	4 19 1
County of London	1	11	10½	43/9	—	4 16 0
Edmundsons' 7% Pref.	1	7	7	26/-	+6d.	5 7 8
Elec. Dis. Yorkshire	1	9	9	35/-	—	5 3 10
Elec. Supply Corporation	1	11	—	47/6	—	4 13 7
Kensington Ordinary	1	8	8	28 6	—	4 18 3
Lancs. Light and Power	1	6½	7	27/-	—	5 3 3
London & Home Counties 4½% Deb.	Stock	4½	4½	96½	+1	4 13 3
London Electric	1	9	9	28/-	—	5 0 0
Metropolitan	1	10	10	41/3	—	4 17 0
Midland Counties	1	7	7	28/9	—	4 17 5
Mid. Elec. Power	1	8	8	30/6	—	5 5 0
Newcastle-on-Tyne Ordinary	1	6	6	23/9	—	5 1 1
Do. 7% Pref.	1	7	7	27/6	—	5 1 10
Northampton	1	10	10	40/9	—	4 18 2
Notting Hill 6% Pref.	10	6	6	11	—	5 9 1
North Met. Elec. 6% Pref.	1	6	6	24/6xd.	+6d.	4 18 0
St. James' and Pall Mall	1	8	8	28/-	—	5 0 0
Scottish Power	1	8	—	28/3	−6d.	5 13 3
South London	1	8½	8½	28/-	—	5 0 0
Urban Ordinary	1	7	—	28/-	—	5 0 0
Westminster Ordinary	1	8½	8½	28/-	—	5 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	16/3	−⅛	9 4 8
Yorkshire Elec.	1	8	8	33/9	—	4 14 10
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	72½	—	5 10 4
Metropolitan	„	4	3½	35½	+4	9 17 2
Do. District	„	5	4½	51½	—	8 14 10
Underground Electric	1	8	7	18/-	—	7 15 7
TELEGRAPHS AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	135	—	6 13 4
Anglo-Am. Tel. Pref.	Stock	6	6	98½	−1	6 1 10
Do. Def.	„	1½	1½	23½	—	6 7 8
Cables & Wireless 5½% Pref.	„	5½	5½	42½	−3	—
Do. A 7½% Ord.	„	Nil	—	13½	−½	—
Do. B Ord.	„	Nil	—	9	—	—
Globe Tel. and T. Ord.	10	10	8½	4½	—	—
Do. do. Pref.	10	6	6	7	—	8 11 6
Great Northern Tel.	10	20	20	22½	—	8 17 10
Marconi-Marine	1	15	15	24/6	−6d.	8 3 4
Oriental Telephone Ord.	1	12	12	2½	+⅛	*5 6 8
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	5½	—	6/3	—	—
Do. do. 2nd Pref.	5	6	—	3/9	—	—
Do. do. 5% Deb.	Stock	5	5	9	—	—
British Electric Traction Def. Ord.	„	5	5	725	−25	—
Do. do. Pref. Ord.	„	8	8	119½	−2	6 14 0
Brazil Traction	100	8	—	12	+1	—
Brit. Columbia Elec. Rly. Pfd.	Stock	5	5	89½	—	5 11 9
London & Sub. Trac. 5% Pref.	1	Nil	Nil	3/9	—	—
London United Tram Deb.	Stock	4	4	57½	—	6 19 2
Mexico Trams, 5% Bonds	—	5	5	32½	—	15 7 8
Mexico Light Common	100	Nil	Nil	15½	—	—
Do. 7% Pref.	100	7	7	29½	—	23 14 8
Do. 1st Bonds	—	5	5	69½	−2	7 3 10
Victoria Falls Ord.	1	15	15	58/3	−1/9	5 3 6
Yorkshire (West Riding)	1	Nil	Nil	5/3	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	6	6	18/3	—	4 11 5
Do. Pref.	1	8	8	28/9	—	5 11 4
Babcock & Wilcox	1	15	14	43/9	−⅛	6 7 5
British Aluminium Ord.	1	10	10	24/6	—	4 1 8
British Insulated Ord.	1	15	15	57/6	−2/3	5 4 2
Brush Ord.	Stock	10	5	57	—	8 15 6
Callender's	1	15	15	56/3	−⅛	5 6 8
Do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Ord.	5/-	30	30	18/9	—	8 0 0
Do. 8% Pref.	1	8	8	27/6	—	5 16 5
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 9
Do. 5% Deb.	Stock	5	5	89½	—	5 11 10
Electric Construction	1	5	Nil	7/6	—	—
Enfield Cable Ord.	1	25	25	3½	—	7 2 10
English Electric	1	Nil	Nil	8/9	—	—
Do. do. Pref.	1	Nil	Nil	10/-	—	—
Ever Ready	5/-	35	35	25/-	+6d.	7 0 0
Ferranti Pref.	1	7	7	22/-	—	6 7 3
G.E.C. Pref.	1	6½	6½	26/-	—	5 0 0
Do. Ord.	1	14	10	36/3	+6d.	5 9 7
Henley's	1	30	30	5½	−⅛	5 16 8
Do. 4½ Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	5/9	—	—
Johnson & Phillips	1	10	10	1	—	10 0 0
Siemens Ord.	1	7½	7½	21/3	—	7 1 2
Telegraph Construction	12	10	7½	9	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1930

26,379. "Heating liquids by electricity." W. Orpen and J. G. Perkins. June 4th, 1931. (370,054.)
27,978. "Electric motors." E. Blank. September 18th, 1929. (369,952.)
27,177. "Heat energy vehicle with electric power transmission." L. Mellersh-Jackson (Siemens-Schuckertwerke Akt.-Ges.). September 20th, 1930. (369,954.)
28,701. "Prepayment electricity meters." Ferranti, Ltd., and G. R. Z. de Ferranti (legal representative of S. Z. de Ferranti, deceased). September 25th, 1930. (369,959.)
28,745. "Operation of electrical discharge devices." A. S. Riggs. September 25th, 1929. (370,021.)
32,944. "Wireless receiving sets." C. L. P. Dean and C. W. H. Begbie. November 1st, 1930. (369,983.)
34,499. "Power-driven hand-directed hair-cutting, massaging, and the like toilet appliances." R. Bosch Akt.-Ges. October 10th, 1930. (369,960.)
34,600. "Electrical impedance networks." Telefonaktiebolaget L. M. Ericsson. November 18th, 1929. (369,984.)
35,232. "Production of electricity by means of a fuel cell." G. Hughes (Dr. H. Greger). November 22nd, 1930. (369,920.)
35,312. "Electric moving-iron quotient-measuring instrument." Ges. W. H. Joens & Co. November 22nd, 1929. (369,921.)
36,009. "Electrical switches." M. Payne. November 29th, 1930. (369,903.)
37,596. "Electric rare-gas discharge lamps." A. Lederer. December 28th, 1929. (369,987.)
37,800. "Electric arc welding apparatus." British Thomson-Houston Co., Ltd. December 13th, 1929. (369,988.)
38,291. "Acoustic diaphragm." E. O. Persson. December 19th, 1929. (369,992.)
38,313. "Transformers for direct current input." B. C. von Platen. December 19th, 1930. (369,993.)
38,650. "Electric time switch mechanism." Fabrik Elektr. Apparate F. Sauter Akt.-Ges. December 23rd, 1929. (369,933.)
38,665. "High frequency signalling systems." Standard Telephones & Cables, Ltd. (M. C. Tournier). December 23rd, 1930. (369,934.)
38,831. "Electric furnaces of the resistance type." Birmingham Electric Furnaces, Ltd., and A. G. Lobley. December 24th, 1930. (370,029.)
38,938. "Apparatus for use in connection with associated sound and picture films." Marconi's Wireless Telegraph Co., Ltd., H. J. Round, and A. W. Langridge. December 24th, 1930. (369,973.)
38,939. "Electrical impedance networks." N. M. Rust. December 24th, 1930. (370,030.)
39,049. "Electron-discharge timing device." J. D. Le Van and C. Stansbury. January 2nd, 1930. (370,002.)
39,053. "Combined overload circuit-breaker and tumbler switch." G. S. Marston and J. G. Statter. December 29th, 1930. (369,906.)
39,091. "Distant indicating devices." International General Electric Co., Inc. December 30th, 1929. (370,031.)
39,322. "Product for preventing corrosion at the joints of electric conductors." J. Bauza. January 4th, 1930. (370,036.)

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114. "Electric totalisators." Automatic Electric Co., Ltd., and J. W. McClew. January 1st, 1931. (370,016.)
166. "Circuit arrangement for telegraph exchange system." R. J. Berry (C. Lorenz Akt.-Ges.). January 2nd, 1931. (370,041.)
218. "Automatic switches for use in telephone or like systems." Automatic Electric Co., Ltd., C. R. Woodland, and J. H. Ellis. January 2nd, 1931. (370,044.)
237. "Arrangement for the transmission of intelligence by the use of the existing telephone network of any suitable central system." Naamlooze Vennootschap Elin Nederlandsche Maatschappij Voor Electrische Industrie. September 11th, 1930. (370,045.)
309. "Amplifying or like devices for coupling two electric circuits." Associated Telephone & Telegraph Co. January 11th, 1930. (370,050.)
639. "Electric plug-and-socket connections." E. Homberger. January 7th, 1931. (370,061.)
835. "Electric meters and like induction motor movements." Ferranti, Ltd., and F. H. Batt. January 9th, 1931. (370,067.)
2,592. "Telephone exchange systems." Soc. Nouvelle de Constructions Téléphoniques Brevets Tchoubritch-Derval. January 31st, 1930. (370,086.)
3,051. "Electric motor control systems." Westinghouse Electric & Manufacturing Co. February 15th, 1930. (370,091.)
3,142. "Electric cut-outs." Appareillage Gardy Soc. Anon. January 31st, 1930. (370,092.)
3,357. "Automatic electric switches for installations of the type provided with an earthing conductor." E. Oades. February 3rd, 1931. (370,095.)
3,591. "Starting devices for electric motors." British Thomson-Houston Co., Ltd., and S. N. Bourne. February 4th, 1931. (370,097.)
3,863. "Control devices for electromagnets." Igranic Electric Co., Ltd., and A. H. Mackley. February 6th, 1931. (370,100.)
3,888. "Superheterodyne receiving circuits." General Electric Co., Ltd., and N. R. Bligh. February 6th, 1931. (370,101.)
4,132. "High potential dynamo-electric machines." Akt.-Ges. Brown Boveri et Cie. May 30th, 1930. (370,104.)
4,471. "Device for the progressive segmentary illumination of luminous electric discharge tubes." J. Brettmon. February 12th, 1931. (370,107.)
4,589. "Electric terminals." British Electric Transformer Co., Ltd., and R. Smith. February 13th, 1931. (370,109.)
5,270. "Voltage failure protection devices." Igranic Electric Co., Ltd., and S. R. Wright. February 19th, 1931. (370,122.)
5,826. "Directional radio systems." Telefunken Ges. für Drahtlose Telegraphie and W. Ludenia. February 25th, 1930. (Addition to 81/31.) (370,135.)
6,259. "Deep sea electric telephone cables." E. Sichtermann. February 27th, 1930. (370,140.)
6,305. "Electrical selecting arrangements for controlling the connection of individual to common apparatus." Ericsson Telephones, Ltd., and C. W. Wilman. February 28th, 1931. (370,141.)
6,317. "Circuit for testing electrically operated photographic flash-lamps." Sashalite, Ltd., and J. A. M. Harker. February 28th, 1931. (370,142.)
6,616. "Delay action or timing devices, particularly suitable for use in connection with electric control apparatus." W. H. Scott. March 3, 1931. (370,148.)
6,709. "Electric cables." Callender's Cable and Construction Co., Ltd., and P. V. Hunter. March 4, 1931. (370,149.)
7,035. "Electric heating devices." Albright & Wilson, Ltd., and G. King. March 6, 1931. (370,151.)
7,092. "Electric heaters." T. Gilmour. March 6, 1931. (370,152.)
8,860. "Electric lampholder adaptors." Belling & Lee, Ltd., and E. M. Lee. March 23, 1931. (370,171.)
9,031. "Electric discharge tubes." M-O Valve Co., Ltd., C. G. Eden, and C. J. Smithells. March 24, 1931. (370,174.)
10,037. "Electric lampholders and fittings." S. W. Hamlyn and Dernier & Hamlyn, Ltd. April 2, 1931. (370,186.)
10,296. "Microphones." Melodium, S.a.r.l. April 7, 1930. (370,188.)
11,817. "Electrical insulation suitable for paper condensers or other apparatus." J. Lahousse. April 22, 1930. (370,199.)
13,771. "Coupling or connection of electric wires and the like." L. H. Reid. May 9, 1931. (370,224.)
15,634. "Speed-regulating systems for dynamo-electric machines." Westinghouse Electric and Manufacturing Co. July 30, 1930. (370,242.)
15,673. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. May 28, 1930. (370,244.)
15,991. "Radiating antenna arrangements." Marconi's Wireless Telegraph Co., Ltd. June 23, 1930. (370,247.)
16,003. "Electrostatic loud speakers." A. Rauser and W. Steuer. June 1, 1931. (370,248.)
16,016. "Posts or towers for carrying electric conductors and the like." R. E. Ellis (American Bridge Co.). June 1, 1931. (370,249.)
16,490. "Apparatus for sounding the depths of water." Compagnie Générale de Télégraphie sans Fil. June 12, 1930. (370,253.)
18,879. "Loading coils." Siemens and Halske Akt.-Ges. July 30, 1930. (370,271.)
20,179. "Inductance coils." C. F. Burton and H. Burton. July 14, 1931. (370,281.)
20,508. "Gas controllers, electric time switches, and like timing devices." K. J. Horstmann, J. H. G. Horstmann and Horstmann Gear Co, Ltd. July 17, 1931. (370,284.)
21,788. "Electron-discharge tubes or thermionic valves." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Nov. 22, 1930. (Addition to 327,048.) (370,297.)
22,077. "Electrodes and electrode arrangements for electron tubes." Vereinigte Gluhlampen und Electricitäts Akt.-Ges. and Elektrische Gluhlampen-Fabrik Watt Akt.-Ges. August 4, 1930. (370,298.)
22,416. "Gas blast electric circuit breakers." International General Electric Co., Inc. August 7, 1930. (370,301.)
22,985. "Spindles, more particularly for electric centrifuges, electric doubling spindles and the like." Siemens-Schuckertwerke Akt.-Ges. August 23, 1930. (370,302.)
23,890. "Method of and means for producing multicolour effects with discharge tubes." G. Claude. August 26, 1930. (370,310.)
24,023. "Means for ventilating dynamo-electric machines." International General Electric Co., Inc. August 27, 1930. (370,312.)
25,550. "Electric cables." International General Electric Co., Inc. September 12, 1930. (370,326.)
27,010. "Electric cables." Soc.-Italiana Pirelli. October 14, 1930. (370,336.)
27,241. "Luminous electric discharge tubes." General Electric Co., Ltd. November 5, 1930. (Addition to 352,352.) (370,338.)
32,358. "Method of radio transmission on ultra-short waves." M. Von Ardenne. November 22, 1930. (370,351.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections may be entered against any of the proposed marks within one month from April 20th.

Hotpoint Spic Span (lettering and design). No. 529,755, and Hotpoint Junior (lettering and design). No. 529,756. Class 6. Electric vacuum cleaning machines.—Hotpoint Electric Appliance Co., Ltd., 24, Newman Street, W.1.

Permag (lettering and design). No. 528,514. Class 8. Loud speakers.—A. Baker, trading as Baker's Selhurst Radio, 89, Selhurst Road, South Norwood, S.E.25.

Alverne. No. 529,900. Class 8. Automatic electric lighters.—D. B. Hampton, 53, South Croxted Road, Dulwich, S.E.21.

Scophony. No. 530,306. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Scophony, Ltd., 2 & 4, Dean Street, W.1.

Ardoloy. No. 528,585. Class 12. Hand tools with a cutting edge.—British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.

Cleo. No. 527,755. All goods in Class 13.—Lectra-Rays, Ltd., 3, Fleet Lane, E.C.4.

Litenlife. No. 530,087. Class 50. Electric lampholders made principally of synthetic resin.—H. Shilman, 50, Philpot Street, Stepney, E.1.

Castle V.F. (lettering and design). No. 529,895. Class 50. Vulcanised fibre manufactured from paper.—Vulcanised Fibre, Ltd., Broadford Mills, Shalford, Surrey.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ardleigh (ESSEX).—Works, &c., Ipswich Road, for the Redwing Aeroplane Co.

Ashton-under-Lyne.—Cinema (2,000 seats) for the Lancashire Entertainments, Ltd.; J. Knight, architect, 5, Cross Street, Manchester.

Bakewell (DERBYSHIRE).—Houses (80); R.D.C. surveyor.

Barnet.—Flats, Colney Hatch Lane; W. S. Dakers, 110, Jermyn Street, S.W.1.

Birkenhead.—Church, Higher Bebington; Borough Wesleyan Church Sites Committee.

Birmingham. — Congregational Church, Station Road, Knowle; W. Bishop, contractor, York Road, King's Heath. Factories, King's Norton, for Slough Estates, Ltd.; F. J. Goch, secretary.

Blyth (NORTHUMBERLAND).—Houses (50), Malvins Close; L. Leeper, borough surveyor.

Bournemouth.—Junior school, Kinson; borough engineer. Coach station, Wickham Road; Wickham Rubber Co., Ltd. Showrooms, Christchurch Road; Stanborne Motor Co., Ltd.

Bramley (YORKS).—Extensions, Bath Lane Mills, Bramley; Victor Bain & Johnson, architects, 38, Albion Street, Leeds.

Brentford.—Housing scheme, Clayponds Estate; U.D.C. surveyor. Houses (20) and flats (16), Church Walk, and houses (140), Syon Estate; Grosvenor Construction Co., Ltd.

Bridlington.—Houses (50), South Back Lane; A. Everingham, architect, Town Hall.

Burntwood (STAFFS).—Extension to County Mental Hospital; E. Joy, clerk to Staffs Mental Hospitals Board, Stafford.

Burton-on-Trent.—Shops (23), Market Place; R. S. Litherland, architect.

Buxton.—Houses (60), Heathgrove Estate; F. Langley, borough architect, Town Hall.

Cardiff.—Mills, Roath Dock, for Messrs. Spillers & Bakers; Clark & Sons, architects, 3, Rumford Place, Liverpool.

Carlisle.—Dairy, Botcherby, for the Co-operative Wholesale Society, Ltd.; C.W.S. architect, Balloon Street, Manchester.

Cheddleton (STAFFS).—Extension to County Mental Hospital; E. Joy, clerk to Staffs Mental Hospitals Board, Stafford.

Chelmsford.—Aircraft factory for Aviation Transport Sales & Service Ltd.; Capt. H. M. Talbot Lehmann, general manager.

Chirk (DENBIGHSHIRE).—Houses (78), Black Park Colliery Co.

Clydebank.—Houses (72) (£24,000); borough surveyor.

Coalville.—Weaving factory, Highfields Street; Orton & Co., builders, London Road.

Corstorphine.—Plant, &c., for Braehead Quarry, Four Mile Hill, Craig's Road, Corstorphine; manager, Corstorphine Whinstone Quarry Co., Ltd., Edinburgh.

Coulsdon.—Houses (42), St. James Road Estate; E. T. Brown & Son.

Coventry.—Offices, Hertford Street, for the Pearl Assurance Co., Ltd., High Holborn, W.C.

Croydon.—Church, Barrow Road; W. Curtis Green & Partners, 5, Pickering Place, St. James's Street, S.W.1. Houses (48), Kingslyn Estate; J. G. Calcot, 36, Winterbourne Road. Houses (23), Holmesdale Road; E. F. Bates, Oaks Road.

Derbyshire.—Extensions, including laboratories and library, Chesterfield Technical College; G. H. Widdows, county architect, St. Mary's Gate, Derby.

Doncaster.—School (450 places) for the Borough E.C.; director of education. Cinema, Hall Gate; F. M. Horsfall, divisional superintendent of the Gaumont-British Picture Corporation.

Dumfriesshire.—Houses (210), various districts, for the C.C.; clerk, Dumfries.

Durham.—Improvements, Chilton East Farm, Ferryhill station, for Durham County Agricultural Committee; W. Carter, architect, 23, Old Elvet, Durham.

Earsdon (NORTHUMBERLAND).—Houses (20); Mr. Burgess, surveyor, Council Offices.

Edinburgh.—School, Niddrie Mains housing area (£27,000); city architect.

Edmonton.—Factory for Kye Electrical Co., Ltd.; Commercial Structures, Ltd., builders, 61, City Road, E.C.1. Cinema, Silver Street; Florida Cinema, Ltd.

Enfield.—Two factories, stores and garage, Cambridge Arterial Road; Mr. A. E. Wright, architect, High Street, Epping. Extensions to Sangamo Works, Cambridge Arterial Road; Wimperis, Simpson & Guthrie.

Essex.—Extensions, Institution nurses' home (£5,700), Colchester; county architect, Chelmsford. Elementary school, Sible Hedingham, and county hall extensions, Chelmsford, for the C.C.; J. Stuart, county architect.

Exeter.—Church; Rev. F. C. Eddy, vicar of St. Mark's, 13, Mont le Grand, Exeter.

Folkestone.—Houses, Wells Road; S. J. Clark, builders, 14, Quested Road, Cheriton, Kent.

Garstang.—Branch bank for the District Bank, Ltd.; F. Jones and H. A. Dalrymple, architects, 178, Oxford Road, Manchester.

Glamorgan.—School, Bridgend; County E.C.

Greenock.—R.C. school (£50,000); J. W. Laird & Napier, architects, 219, Vincent Street, Glasgow.

Guildford.—Factory extensions for Dennis Bros. (£25,000); F. Milton & Sons, Ltd., contractors, Witley.

Halifax.—Houses (30) and bungalows (16), with electrical work; D. T. Lloyd Jones, borough engineer. Three-storey extension, Trinity Works, for G. H. Gledhill & Sons, Ltd.; A. Pickles, architect, Lord Street.

Haverfordwest.—Library; O. T. Thomas, architect, Education Office.

Hayes (KENT).—Houses (901) and shops, Hayes Place Estate, for Henry Boot & Sons, Ltd., 12, Lower Grosvenor Place, S.W.

Hendon.—Houses, Sunnyfields Estate; R. C. Campbell, architect, Eastern Court Annexe, Neasden Lane, N.W.10.

Herts.—Extensions, Hitchin Institution and casual wards, with lighting and heating work (£31,710), for the P.A.C.; W. H. Hobday, architect, 2, Wood Street, Westminster, S.W.1.

Highfield (DURHAM).—R.C. school; R. Burke, architect, 12, Grey Street, Newcastle-on-Tyne.

Houghton-le-Spring (Co. DURHAM).—Houses (80); R. Richardson, R.D.C. surveyor.

Irish Free State.—(ACHILL).—District hospital; F. Gitsney, architect, 16, Westmorland Street, Dublin. (BUNCRANA, Co. DONEGAL).—Houses (22) for the U.D.C.; J. P. McGrath, architect, Newmarket Street, Derry. (DUBLIN).—Houses, Stella Avenue and Rathlin Road, Drumcondra (£8,900); Dublin Commercial Public Utility Society, Ltd. Houses (358), Cabra housing area; Corporation housing architect, Exchange Buildings, Lord Edward Street. (STREETE, Co. WESTMEATH).—Reconstruction of Boherquill Church; M. Grace, architect, Castle Street, Oldcastle. (TRALEE).—Electrical installation, Bon Secours Nursing Home; G. Deane Roe, architect, 13, South Mall, Cork. Schools at Glenamoy, Co. Mayo; Lixnaw, Beaufort, and Castlemaine, Co. Kerry; Carrickbyrne, Co. Wexford; Ballynoe, Co. Cork.

Laindon (ESSEX).—Re-erection of premises for Churchill Johnson, Ltd., builders' merchants (£10,000).

Lanarkshire.—Houses (52), Salsburgh; C.C. clerk, Glasgow.

Lancashire.—School, Leyland; County E.C.

Lee-on-the-Solent.—Church (£8,000); John Hunt, builder, Cleveland Road, Gosport.

Leicester.—Corporation offices; Special Office Accommodation Committee.

Leyton.—School, Connaught Road, Leytonstone, for Borough Council; J. H. Jacques, architect, 61, West Ham Lane, E.15.

Lincoln.—Extensions to hospital (£15,000); board of governors.

London.—Extensions to mental hospitals (£130,000); L.C.C. architect (BERMONDSEY).—Flats (24), Elgar Street; borough works manager. (HACKNEY).—Schools, Mount Pleasant Lane; L.C.C. (WOOLWICH).—School, Middle Park; L.C.C. (STOKE NEWINGTON).—Factory extension for Aspley Manufacturing Co., Church Street and Kersley Road; A. W. Pipe.

Manchester.—Elementary school (accommodation 1,000), Victoria Avenue, East, Blackley; director of education, Education Offices, Deansgate. Pumping stations (3), for sewage works, Sale; G. B. Kershaw & Kaufman, engineers, 9, Victoria Street, S.W.1.

Middlesex.—Schools, Hayes; County E.C.

Montrose.—Nurses' home (£37,000); managers of Montrose Royal Asylum.

Newcastle-on-Tyne.—Steel fitting shop for the Liner Concrete Machinery Co., Ltd.; J. B. Smith, engineer, Newcastle. R.C. school, Manchester Street; R. Burke, architect, 12, Grey Street. Branch premises for C.W.S.; C.W.S. Architects' Dept., 90, Westmorland Road, Newcastle. Coach building works for Messrs. Rington, Heaton; Henderson Bros., builders, Smith Street, South Shields.

Northern Ireland.—(DRUMBEGGAN).—Elementary school; J. Donnelly, architect, Town Hall, Enniskillen.

Paignton.—Houses (41), Collaton; Coombe & Son. Houses (20), Combe Road; R. Peeke & Son.

Pilling (LANCS).—Branch bank for the District Bank, Ltd.; Francis Jones & H. A. Dalrymple, architects, 178, Oxford Road, Manchester.

Preston.—Elementary school, Greenland Estate; director of education, Education Offices.

St. Helens (LANCS).—Houses (84); A. P. Statham, borough engineer. Extension to Providence Free Hospital; secretary.

Shanklin (I.O.W.).—Theatre; proprietors of The Playhouse.

Sheffield.—Factory, for Lenton & Rusby; J. Shepherd, architect, Town Hall Chambers, 87, Fargate, Sheffield.

Slough.—Factories, Farnham Road, for Intertype, Ltd., 15, Britannia Street, W.C.

South Moor (DURHAM).—R.C. church; Kindred & Co., builders, Newcastle.

Stainforth.—Church; J. B. Richardson, architect, 27, Printing Office Street, Doncaster.

Standish-with-Langtree (LANCS).—Houses (40); U.D.C. surveyor.

Stanley (Co. DURHAM).—R.C. Church, Hustle Down, South Moor; Rev. W. Pickering, St. Joseph's, South Moor, Stanley.

Stannington (NORTHUMBERLAND). — Children's Sanatorium (£12,000), for the P.C.H.A.; J. Wilson, builder, Morpeth.

Stockport.—Council school, Southwood Road (£18,000); R. Carlyle & Co., Ltd., builders, Elsinore Road, Trafford Park, Manchester.

Sunderland.—Schools, Commercial Road, and Ford Estate, for the E.C.; O. T. Mark, architect, Town Hall.

Sussex.—Schools, Hailsham, Rye, Hove; H. E. Lunn, county surveyor, Lewes.

Sutton-in-Craven (YORKS).—Works extensions, The Wood Turneries, for W. & J. R. Thompson.

Swansea.—Houses (500), Townhill; J. R. Heath, borough architect.

Thornaby-on-Tees.—Extensions to Cleveland Flour Mills; Gelder & Kitchen, architects, 120, Alfred Gelder Street, Hull.

Thornton Heath.—Cinema, London Road; A. C. Matthews, 86, College Road, S.E.21.

Wealdstone (MIDDLESEX).—Houses (24), Glebe Avenue; A. E. Mellor.

Wembley.—Houses (54), Manor Farm Estate; U.D.C. surveyor.

West Hartlepool.—Houses (50); F. Durkin, borough engineer.

Weymouth.—Houses (62); borough surveyor.

Whitley Bay (NORTHUMBERLAND).—Christian Science Church (£5,000); Davidson & Sherwood, architects, 32, Clayton Street, Newcastle.

Winchester.—Houses (94), Highcliffe Park Estate; city surveyor.

Yarmouth.—Church, North Denes Estate; vicar of Yarmouth. Theatre, Theatre Royal site; H. Lynde, for Theatre Royal Syndicate.

Yorkshire.—School, Whitby, for North Riding E.C.; director of education, Northallerton.